PRASAD V POTLURI SIDDHARTHA INSTITUTE OF TECHNOLOGY
(Autonomous)

ACADEMIC RULES &REGULATIONS (PVP20)
and
B.Tech Course Structure, Syllabus

Applicable for the batch of students admitted from the Academic Year 2020-2021

DEPARTMENT OF INFORMATION TECHNOLOGY

PRASAD V. POTLURI SIDDHARTHA INSTITUTE OF TECHNOLOGY
(Autonomous)
AICTE approved, NBA & NAAC A^+ Accredited, An ISO 9001:2015 certified Institution
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w.e.f. A.Y 2020 – 2021

PREFACE

PVP Siddhartha Institute of technology, established in 1998, is one of the seventeen educational institutions sponsored and run by Siddhartha Academy of General & Technical Education. The 250 members of the Academy are a group of industrialists, educationists, auditors and philanthropists with vast experience in their respective fields and above all with an ardent desire to spread quality Education. All the academic organizations of Siddhartha Academy stand symbolic of the pragmatic vision of its founders. PVP Siddhartha Institute of Technology has the advantage of inheriting the higher academic standards. The college is approved by AICTE and is permanently affiliated to JNTUK. It is certified by ISO 9001-2015 for its quality standard. All the UG Programs are accredited by the National Board of Accreditation and NAAC with A^+ grade. It is an Autonomous institute.

The curriculum is revised continuously to address the challenges of industry and academia and to foster the global competencies among the students. The curriculum is revised thrice since 2012. The present curriculum(PVP20) is designed incorporating the features such as outcome based approach, encouraging self-learning through MOOCs platforms i.e., Swayam, COURSERA, EDX, NPTEL, etc., Transformation of creative ideas into a prototype through Internship & Project, enhancing depth & breadth by introducing more number of programs, open electives in core and multi-disciplinary areas, offering courses by industry experts to improve Industry Institute Interaction in addition to internships at industry and introduction of wide range of value added courses beyond curriculum to choose according to their interest to enhance their employability skills.

Institute Vision

To provide rich ambience for Academic and Professional Excellence, Research, Employability skills, Entrepreneurship and Social responsibility.

Institute Mission

To empower the students with Technical knowledge, Awareness of up-to-date technical trends, Inclination for research in the areas of human needs, Capacity building for Employment / Entrepreneurship, Application of technology for societal needs.

Quality Policy

At PVPSIT, We commit ourselves to offer Quality professional education in engineering & Management by adhering to applicable statutory and regulatory requirements and through continuous improvement in the Quality of our services by,

- Regular up gradation of knowledge and skills of faculty
- Improving the teaching methods and strategies
- Providing state of art infrastructure
- Recruiting competent faculty and maintaining prescribed Teacher Student ratio
- Improving the employability of students
- Enhanced Collaboration with industry and institutions of National Repute

DEPARTMENT OF INFORMATION TECHNOLOGY

VISION OF THE DEPARTMENT

To be a model center for Education and Training in the frontier areas of Information Technology

MISSION OF THE DEPARTMENT

Offer High Quality Teaching and Learning in information Technology to prepare students for higher studies and professional career in industry

PROGRAM EDUCATIONAL OBJECTIVES	
PEO	**STATEMENTS**
PEO I	**Shine as IT Expert with Proficiency in designing solutions to Information Engineering problems.**
PEO II	**Pursue higher studies with the sound knowledge of fundamental concepts and skills in basic sciences and IT disciplines.**
PEO III	**Showcase professionalism, team work and expose to current trends towards continuous learning**
PEO IV	**Equipped with integrity, ethical values and become responsible Engineers.**

PROGRAM OUTCOMES (PO's)	
PO 1	**Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO 2	**Problem analysis**: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
PO 3	**Design/development of solutions**: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
PO 4	**Conduct investigations of complex problems**: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
PO 5	**Modern tool usage**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
PO 6	**The engineer and society**: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
PO 7	**Environment and sustainability**: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
PO 8	**Ethics**: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO 9	**Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO 10	**Communication**: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
PO 11	**Project management and finance**: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one"s own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

PO 12	**Life-long learning**: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.
PROGRAM SPECIFIC OUTCOMES (PSOs)	
PSO1	**Ability to understand, analyze and develop computer programs in the areas related to Algorithms, system software, application software, web design, big data analytics, database design and networking for efficient design of computer based systems of varying complexity.**
PSO2	**Ability of analyzing the general business functions to design and develop with appropriate Information Technology solutions.**

QUALITY POLICY

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- Regular up gradation of knowledge and skills of faculty
- Improving the teaching methods and strategies
- Providing state of art infrastructure
- Recruiting competent faculty and maintaining prescribed Teacher Student ratio
- Improving the employability of students
- Enhanced Collaboration with industry and institutions of National Repute

CONTENTS

Engineering UG Programmes

Introduction

The redesigned curriculum focused on up skilling the graduates on the skills relevant to the need and demands of the industry. The curriculum mandates students to take up five skill courses which are relevant to the industry from second year onwards, two basic level skill courses, one on soft skills and other two on advanced level skill courses. The students are also given the option of choosing between skill courses offered by the Institute and a certificate course offered by industry, a professional body, APSSDC or any other accredited body.

Another major change brought in the curriculum is the introduction of B.Tech. with Honors or a B.Tech with a Minor. This is to give an opportunity for the fast learners to earn additional credits either in the same domain or in a related domain, making them more proficient in their chosen field of discipline or be a graduate with multidisciplinary knowledge and job ready skills.

Mandatory Internship, both industry and social, is included in the revised curriculum that aims at making engineering graduates connect with the needs of the industry and society at large. It will be mandatory for the students to intern in the industry/field for four to six weeks during the summer vacation and also in the final semester to acquire the skills required for job.

The redesigned curriculum offers academic flexibility by introducing a pool of inter-disciplinary and job-oriented skill courses which are integrated in to the curriculum of each branch of engineering, from which a student can pick his choice. Flexibility is not only given to students in the choices of courses, but flexibility is given in choosing courses either from the pool of courses offered by the concerned department or in choosing the courses offered by APSSDC or by any other reputed organization/professional body which offers with certification, as decided by respective BoS. Hence, the students are given wide choice and flexibility to undertake courses, while at the same time offering relevance to the interest of individual student in their own context. The curriculum also gives flexibility to the institution in offering a variety of courses to the students of a particular discipline. The Board of Studies is empowered to identify as many tracks and pools as possible in emerging technologies and industrial relevance, and also in humanities and sciences.

1. SHORT TITLE AND COMMENCEMENT

a. The regulations listed under this head are common for all degree level undergraduate programmes (B.Tech.), offered by the college with effect from the academic year 2020-21 and they are called as “PVP20” regulations.

b. The regulations here under are subjected to amendments as may be made by the Academic Council of the college from time to time, keeping in view of the recommendations of the Board of Studies. Any or all such amendments will be effective from such date and to such batches of candidates including those already undergoing the programme, as may be decided by the Academic Council.

2. DEFINITIONS

a. “**Commission**” means University Grants Commission(UGC);

b. “**Council**” means All India Council for Technical Education(AICTE);

c. “**University**” means Jawaharlal Nehru Technological University Kakinada(JNTUK);

d. “**College**” means Prasad V Potluri Siddhartha Institute of Technology, Vijayawada;

e. An **Academic Programme** means any combination of courses and/or requirements leading to award of a degree.

f. “**Course**” means a subject either theory or practical identified by its course title and code number and which is normally studied in a semester.

g. “**Degree**” means an academic degree conferred by the university upon those who complete the under graduate curriculum.

h. “**MOOC**” means Massive Open Online Course

i. “**Regular Students**” means students enrolled into the four year programme in the first year.

j. “**Lateral Entry Students**” means students enrolled into the four year programme in the second year.

3. ACADEMIC PROGRAMMES

3.1 Nomenclature of Programmes

3.1.1 The nomenclature and its abbreviation given below, shall continue to be used for the Degree programmes under the University, as required by the Council and the Commission:

Bachelor of Technology (B. Tech)

Besides, the name of specialization shall be indicated in brackets after the abbreviation, for example, engineering degree in Mechanical

Engineering programme is abbreviated as B.Tech (Mechanical Engineering).

3.1.2 Bachelor of Technology (B. Tech.) degree programme is offered in:

1. Civil Engineering(CE)
2. Computer Science and Engineering(CSE)
3. Computer Science and Engineering(AI & ML)
4. Computer Science and Engineering(Data Science)
5. Electronics and Communication Engineering(ECE)
6. Electrical and Electronics Engineering(EEE)
7. Information Technology(IT)
8. Mechanical Engineering(ME)

4. DURATION OF THE PROGRAMMES

4.1 Normal Duration

4.1.1. The duration of an academic programme shall be four years consisting of eight semesters.

4.1.2. The duration of the programme for lateral entry students who are admitted in II year shall be three years that consists of six semesters.

4.2 Maximum Duration

4.2.1 The maximum period for which a student can take to complete a full time academic programme shall be double the normal duration of the programme, i.e., for regular students eight years, for lateral entry students six years.

4.3 Minimum Duration of a Semester

Each semester consists of a minimum of 90 instruction days with about minimum 20 and maximum 33 contact hours per week.

5. ADMISSION CRITERIA

The eligibility criteria for admission into UG Engineering programmes are as per the norms approved by Government of Andhra Pradesh from time to time. The sanctioned seats in each programme in the college are classified into CATEGORY-A, and CATEGORY-B at I year level and only CATEGORY-A at Lateral Entry II year level.

The percentages of Category–A, Category-B and Lateral Entry Seats are decided from time to time by the Government of Andhra Pradesh.

5.1 CATEGORY – A Seats

Category - A seats are filled as per the norms approved by the Government of Andhra Pradesh.

5.2 CATEGORY – B Seats

Category - B seats are filled by the College as per the norms approved by the Government of Andhra Pradesh.

5.3 CATEGORY - Lateral Entry Seats

Lateral entry candidates shall be admitted into the III semester directly as per the norms approved by Government of Andhra Pradesh.

6. CREDIT SYSTEM AND GRADE POINTS

6.1 Credit Definition

'Credit' means quantified and recognized learning. Credit is measured in terms of contact hours per week in a semester. Typically one credit is given to:

(a) Theory/Tutorial course conducted for one contact period.

(b) Laboratory course conducted for two contact periods.

Each course is assigned a certain number of credits depending upon the number of contact hours (Lectures/Tutorials/Practical) per week.

The curriculum of the eight semesters B.Tech program is designed to have a total of 160 credits for the award of B.Tech degree.

For lateral entry students, the curriculum of six semesters B.Tech program is designed to have a total of 121 credits for the award of B.Tech degree.

6.2 Semester Course Load

The average course load shall be fixed at 20 credits per semester with its minimum and maximum limits being set at 12 and 23 credits.

6.3 Grade Points and Letter Grade for a Course

The grade points and letter grade will be awarded to each course based on student’s performance as per the grading system shown in the Table.

Table: Grading System for B. Tech Programme (PVP20 Regulations)

Grades and Grade Points (PVP20 Regulations)

Theory / Drawing (Max-100)	Laboratory/ Mini Project/ Internship etc. (Max – 50)	Level	Grade Point	Letter Grade
≥ 90	≥ 45	Outstanding	10	A+
≥ 80 to ≤ 89	≥ 40 to ≤ 44	Excellent	9	A
≥ 70 to ≤ 79	≥ 35 to ≤ 39	Very Good	8	B
≥ 60 to ≤ 69	≥ 30 to ≤ 34	Good	7	C
≥ 50 to ≤ 59	≥ 25 to ≤ 29	Fair	6	D
≥ 40 to ≤ 49	≥ 20 to ≤ 24	Satisfactory	5	E
< 40	< 20	Fail	0	F (FAIL)
ABSENT	ABSENT	ABSENT	0	AB

* For Major Project same (%) percentages will be followed for grading

6.4 Semester Grade Points Average(SGPA)

The performance of each student at the end of each semester is indicated in terms of SGPA calculated as shown in equation (1)

$$\text{SGPA} = \frac{\sum (CR \times GP)}{\sum CR \text{ (for all courses offered in the semester)}} \quad \text{-- (1)}$$

Where CR= Credits of a course

GP = Grade points awarded for a course

$\sum CR$ = Summation of all the courses offered in the semester

6.5 Cumulative Grade Point Average (CGPA)

The Cumulative Performance of each student at the end of each semester is indicated in terms of CGPA which is calculated as shown in equation (2).

$$CGPA = \frac{\sum CR\ X\ GP}{\sum CR(for\ all\ courses\ offered\ upto\ that\ semester/entire\ program)} \text{-- (2)}$$

Where CR = Credits of a course

GP = Grade points awarded for a course

Percentage equivalent of CGPA = (CGPA – 0.75) * 10

7. CURRICULUM FRAMEWORK

7.1. Regular and Honors B.Tech Programmes of all Branches

1. Award of the Degree: A student will be declared eligible for the award of

   B. Tech. degree if he/she fulfils the following:

   i. Pursues a course of study in not less than four and not more than eight academic years.

   ii. After eight academic years from the year of their admission, he/she shall forfeit their seat in B. Tech course and their admission stands cancelled.

   iii. Registers for 160 credits and must secure all the 160 credits.

   iv. A student shall be eligible for the award of B.Tech degree with Honors or Minor if he / she earns 20 credits in addition to the 160 credits. A student shall be permitted to register either for Honors or for Minor and not for both simultaneously.

2. Structure of the Undergraduate Engineering program:

Every course of B.Tech. Program shall be placed in one of the nine categories as listed in table below:

S. No.	Category	Code	Suggested breakup of Credits (APSCHE)	Suggested breakup of Credits (AICTE)
1	Humanities and social science including Management courses	HSMC	10.5	12
2	Basic Science courses	BSC	21	25
3	Engineering Science courses	ESC	24	24
4	Professional core Courses	PCC	51	48
5	Open Elective Courses	OEC	12	18
6	Professional Courses Elective	PEC	15	18
7	Internship, project work seminar, Community Service Project	PROJ	16.5	15
8	Mandatory courses	MC	Non-credit	Non-credit
9	Skill Oriented Courses	SC	10	-
Total Credits			160	160

3. Assigning of Credits:

   1 Hr. Lecture (L) per week - 1 credit

   1 Hr. Tutorial (T) per week - 1 credit

   1 Hr. Practical (P) per week - 0.5 credits

   2 Hours Practical (Lab)/week - 1 credit

4. There shall be mandatory student induction program for fresher's, with a three-week duration before the commencement of first semester. Physical activity, Creative Arts, Universal Human Values, Literary, Proficiency Modules, Lectures by Eminent People, Visits to local Areas, Familiarization to Dept./Branch & Innovations etc., shall be included in the guidelines issued by AICTE

5. All undergraduate students shall register for NCC/NSS activities. A student will be required to participate in an activity for two hours in a week during second and third semesters. Grade shall be awarded as Completed or Not Completed in the mark sheet on the basis of participation, attendance, performance and behavior, and it is

treated as student practice course . If a student gets an unsatisfactory Grade, he/she shall repeat the above activity in the subsequent years, in order to complete the degree requirements.

6. Courses like Environmental Sciences, Universal Human Values, Ethics, Indian Constitution, Essence of Indian Traditional Knowledge etc., shall be included in the curriculum as non-credit mandatory courses. Environmental Sciences is to be offered compulsorily as mandatory course for all branches. A student has to secure 40% of the marks allotted in the internal evaluation for passing the course. No marks or letter grade shall be allotted for all mandatory non-credit courses.

7. Institution may swap some of the courses between first and second semesters to balance the workload.

8. The concerned Board of studies can assign tutorial hours to such courses wherever it is necessary, but without change in the total number of credits already assigned for semester.

9. There shall be 05 Professional Elective courses and 04 Open Elective courses. All the Professional & Open Elective courses shall be offered for 03 credits, wherever lab component is involved it shall be (2-0-2) and without lab component it shall be (3-0- 0). If a course comes with a lab component, that component has to be cleared separately. The concerned BOS shall explore the possibility of introducing virtual labs for such courses with lab component.

10. All Open Electives are offered to students of all branches in general. However, a student shall choose an Open Elective from the list in such a manner that he/she has not studied the same course in any form during the Programme.

11. A student shall be permitted to pursue up to a maximum of two elective courses under MOOCs during the Programme. Each of the courses must be of minimum 12 weeks in duration. Attendance will not be monitored for MOOC courses. Student has to pursue and acquire a certificate for a MOOC course only from the organizations/agencies approved by the BoS in order to earn the 3 credits. The Head of the department shall notify the list of such courses at the beginning of the semester.

12. The college shall invite registration forms from the students at the beginning of the semester for offering professional and open elective courses. There shall be a limit on the minimum and maximum number of registrations based on class/section strength.

13. Students shall undergo mandatory summer internships for a minimum of four to six weeks duration at the end of second and third year of the Programme. There shall also be mandatory full internship in the final semester of the Programme along with the project work.

14. There shall be 05 skill-oriented courses offered during III to VII semesters. Among the five skill courses, four courses shall focus on the basic and advanced skills related to the domain courses and the remaining one shall be a soft skills course.

15. Under graduate Degree with Honors / Minor shall be issued by the institute to the students who fulfil all the academic eligibility requirements for the B. Tech program and Honors / Minor program. The objective is to provide additional learning opportunities to academically motivated students.

16. Assessment: The performance of a student in each semester shall be evaluated subject wise with a maximum of 100 marks for theory and 50 marks for practical subject. The distribution shall be 30 marks for Internal Evaluation and 70 marks for the End Semester Theory Examinations. 15 marks for Internal Evaluation and 35 marks for the End Semester practical Examinations A student has to secure not less than 35% of marks in the end semester examination and minimum 40% of marks in the sum total of internal and end semester examination marks to earn the credits allotted to each course. Detailed guidelines for continuous evaluation shall be planned by concerned combined BOS of the Universities.

17. **Attendance Requirements**:

i. A student shall be eligible to appear for end semester examinations if he/she acquires a minimum of 75% of attendance in aggregate of all the subjects in a semester.

ii. Shortage of Attendance below 65% in aggregate shall in NO case be condoned.

iii. Condonation for shortage of attendance in aggregate up to 10% (65% and above and below 75%) in each semester may be granted by the College Academic Committee.

iv. Students whose shortage of attendance is not condoned in any semester are not eligible to take their end semester examination of that class and their registration shall stand cancelled.

v. A student will not be promoted to the next semester unless he satisfies the attendance requirements of the present semester, as applicable. They may seek readmission for that semester when offered next.

vi. A stipulated fee shall be payable towards condonation of shortage of attendance to the college. A student is eligible to write the semester end examinations if he acquires 75% of attendance in aggregate of all the subjects.

7.2 General Issues

7.2.1 Curriculum framework is important in setting the right direction for a degree programme as it takes into account the type and quantum of knowledge necessary to be acquired by a student in order to qualify for the award of degree in his/her chosen branch or specialization.

7.2.2 Besides, this also helps in assigning the credits for each course, sequencing the courses semester-wise and finally arriving at the total number of courses to be studied and the total number of credits to be earned by a student in fulfilling the requirements for conferment of degree.

7.2.3 Each theory course shall consist of five units.

7.3 Curriculum Structure

The curriculum is designed to facilitate B. Tech (Honors) and B.Tech (Major, Minor) incorporates courses required to attain the expected knowledge, skills and attitude by the time of graduation as per the needs of the stakeholders. The curriculum structure consists of various course categories (as described in 7.3.1 to7.3.5) to cover the depth and breadth required for the programme and for the attainment of programme outcomes of the corresponding programme.

7.3.1 Institutional Core

Institutional Core consists of the courses required for all UG Engineering Programmes offered in this college. The courses offered under this category cover the required knowledge in the following areas:

a) Basic Sciences:

Basic Science courses include Engineering Physics, Applied Physics, Engineering Physics Lab, Applied Physics Lab Engineering Chemistry, Engineering Chemistry Lab, and Engineering Mathematics, etc.

b) Engineering Sciences:

Engineering Science courses include Problem Solving and Programming, AI Tools, Internet of Things, Design Thinking, Basic Electrical and Electronics Engineering, Engineering Graphics, Problem Solving & Programming Lab, Basic Electrical & Electronics Engineering Lab, AI Tools Lab, Internet of Things Lab, Design Thinking Lab and Basic Workshop, etc.

c) Humanities and Social Sciences:

Humanities and Social Science Courses consist of Communicative English I, Communicative English II, HS Elective, Communicative English-I Lab and Communicative English-II Lab, etc.

7.3.2 Elective Courses

Elective courses are offered across the programmes to enhance the knowledge breadth and professional competency of the students.

Courses	Branch Specific	Compulsory
Elective courses	Professional Electives	Supportive to the discipline courses with expanded scope in a chosen track of specialization or cross track courses
	HS Management Elective	Nurture the student interests in management courses.
	Open Electives	Common to all disciplines that helps general interest of a student

7.3.3 Professional Core

The Professional core consists of set of courses considered which are necessary for the students of the specific programme. The courses under this category satisfy the Programme Specific Criteria prescribed by the appropriate professional societies.

7.3.4 Project

In the final semester, the student should mandatorily undergo internship and in parallel he/she should work on a project with well-defined objectives.

7.3.5 Mandatory Learning Courses

According to the guidelines given by statutory bodies, Courses on Environmental Science, Constitution of India and Engineering Ethics, Life Sciences for Engineers and Life Sciences for Engineers Lab shall be offered. Induction program shall be offered in I semester for all the branches.

7.3.6 Honors Programme

In order to obtain honors degree students shall earn additional 20 credits in addition to the 160 credits for obtaining the UG degree. Students can register for additional courses by satisfying the pre-requisite course(s) to a maximum of 8 credits in each of the semesters from IV semester onwards along with the regular semester courses as prescribed. There is no minimum limit to the credits for taking additional courses.

1. Students of a Department/Discipline are eligible to opt for Honors Programme offered by the same Department/Discipline.
    - A student shall be permitted to register for Honors program at the beginning of 4th semester provided that the student must have acquired a minimum of 8.0 CGPA up to the end of 2nd semester without any backlogs. In case of the declaration of the 3rd semester results after the commencement of the 4th semester and if a student fails to score the required minimum of 8 CGPA, his/her registration for Honors Programme stands cancelled and he/she shall continue with the regular Programme.
    - An SGPA and CGPA of 8.0 and above has to be maintained in the subsequent semesters in major degree without any backlogs in order to keep the Honors degree registration active.
    - Should both the SGPA and CGPA of major degree fall below 8.0 in major degree at any point after registering for the Honors; the Honors degree registration will cease to be active.
2. Students can select the additional and advanced courses from their respective branch in which they are pursuing the degree and get an honors degree in the same. e.g. If a Mechanical Engineering student completes the selected advanced courses from same branch under this scheme, he/she will be awarded B.Tech. (Honors) in Mechanical Engineering.
3. In addition to fulfilling all the requisites of a Regular B.Tech Programme, a student shall earn 20 additional credits to be eligible for the award of B. Tech (Honors) degree. This is in addition to the credits essential for obtaining the Under Graduate Degree in Major Discipline (i.e. 160 credits).
4. Of the 20 additional Credits to be acquired, 16 credits shall be earned by undergoing specified courses listed as pools, with four courses, each carrying 4 credits. The remaining 4 credits must be acquired through two MOOCs, which shall be domain specific, each with 2 credits and with a minimum duration of 8/12weeks as recommended by the Board of studies.
5. It is the responsibility of the student to acquire/complete prerequisite before taking the respective course. The courses offered in each pool shall be domain specific courses and advanced courses.
6. The concerned BOS shall decide on the minimum enrolments for offering Honors program by the department. If minimum enrolments criteria are not met then the students shall be permitted to register for the equivalent MOOC courses as approved by the concerned Head of the department in consultation with BOS.
7. Each pool can have theory as well as laboratory courses. If a course comes with a lab component, that component has to be cleared separately. The concerned BOS shall explore the possibility of introducing virtual labs for such courses with lab component.
8. MOOC courses must be of minimum 8 weeks in duration. Attendance will not be monitored for MOOC courses. Students have to acquire a certificate from the agencies

approved by the BOS with grading or marks or pass/fail in order to earn 4 credits. If the MOOC course is a pass/fail course without any grades, the grade to be assigned will be as decided by the Institute/academic council.

9. The concerned BOS shall also consider courses listed under professional electives of the respective B. Tech programs for the requirements of B. Tech (Honors). However, a student shall be permitted to choose only those courses that he/she has not studied in any form during the Programme.

10. If a student drops or is terminated from the Honors program, the additional credits so far earned cannot be converted into free or core electives; they will remain extra. These additional courses will find mention in the transcript (but not in the degree certificate). In such cases, the student may choose between the actual grade or a "pass (P)" grade and also choose to omit the mention of the course as for the following: The courses which were not done under the dropped Honors will not be shown in the transcript.

11. In case a student fails to meet the CGPA requirement for Degree with Honors at any point after registration, he/she will be dropped from the list of students eligible for Degree with Honors and they will receive regular B.Tech degree only. However, such students will receive a separate grade sheet mentioning the additional courses completed by them.

12. Honors must be completed simultaneously with a major degree program. A student cannot earn Honors after he/she has already earned bachelor's degree.

7.4 Minor Programme:

In order to obtain Minor degree students shall earn additional 20 credits in addition to the 160 credits for obtaining the UG degree. Students can register for additional courses by satisfying the pre-requisite course(s) to a maximum of 8 credits in each of the semesters from IV semester onwards along with the regular semester courses as prescribed. There is no minimum limit to the credits for taking additional courses.

A student shall be permitted to register for Minors program at the beginning of 4^{th} semester subject to a maximum of two additional courses per semester, provided that the student must have acquired 7.75 CGPA (Cumulative Grade point average) up to the end of 2^{nd} semester without any history of backlogs. It is expected that the 3^{rd} semester results may be announced after the commencement of the 4^{th} semester. If a student fails to acquire 7.75 CGPA up to 3^{rd} semester or failed in any of the courses, his registration for Minors program shall stand cancelled.

- An SGPA and CGPA of 7.75 and above has to be maintained in the subsequent semesters in major degree without any backlogs in order to keep the minor registration active.
- Should both the SGPA and CGPA fall below 7.75 in major degree at any point after registering for the minor; the minor registration will cease to be active.

1. a) Students who are desirous of pursuing their special interest areas other than the chosen discipline of Engineering may opt for additional courses in minor specialization groups offered by a department other than their parent department. For example, If Mechanical Engineering student selects subjects from Civil Engineering under this scheme, he/she will get Major degree of Mechanical Engineering with minor degree of Civil Engineering

b) Student can also opt for Industry relevant tracks of any branch to obtain the Minor Degree, for example, a B.Tech Mechanical student can opt for the industry relevant tracks like Data Mining track, IOT track, Machine learning track etc.

2. The BOS concerned shall identify as many tracks as possible in the areas of emerging technologies and industrial relevance / demand. For example, the minor tracks can be the fundamental courses in CE, EEE, ME, ECE, CSE, AND IT etc., or industry tracks such as Artificial Intelligence (AI), Machine Learning (ML), Data Science (DS), Robotics, Electric vehicles, VLSI etc.

3. The list of disciplines / branches eligible to opt for a particular industry relevant minor specialization shall be clearly mentioned by the respective BOS.

4. There shall be no limit on the number of programs offered under Minor. The Institution can offer minor programs in emerging technologies based on expertise in the respective departments or can explore the possibility of collaborating with the relevant industries/agencies in offering the program.

5. Out of the 20 Credits, 16 credits shall be earned by undergoing specified courses listed by the concerned BOS along with prerequisites. It is the responsibility of the student to acquire / complete prerequisite before taking the respective course. If a course comes with a lab component, that component has to be cleared separately. A student shall be permitted to choose only those courses that he / she has not studied in any form during the Programme.

6. The concerned BOS shall decide on the minimum enrolments for offering Minor program by the department. If a minimum enrolments criterion is not met, then the students may be permitted to register for the equivalent MOOC courses as approved by the concerned Head of the department in consultation with BOS.

7. A student shall earn additional 20 credits in the specified area to be eligible for the award of B. Tech degree with Minor. This is in addition to the credits essential for obtaining the Under Graduate Degree in Major Discipline (i.e. 160credits).

8. In addition to the 16 credits, students must pursue at least 2 courses through MOOCs. The courses must be of minimum 8 weeks in duration. Attendance will not be monitored for MOOC courses. Student has to acquire a certificate from the agencies approved by the BOS with grading or marks or pass/fail in order to earn 4credits.If the MOOC course is a pass/fail course without any grades, the grade to be assigned as decided by the Institute/academic council.

9. Student can opt for the Industry relevant minor specialization as approved by the concerned departmental BOS. Student can opt the courses from Skill Development Corporation (APSSDC) or can opt the courses from an external agency recommended and approved by concerned BOS and should produce course completion certificate. The Board of studies of the concerned discipline of Engineering shall review such courses being offered by eligible external agencies and prepare a fresh list every year incorporating latest skills based on industrial demand.

10. A committee should be formed at the level of College / Universities / department to evaluate the grades / marks given by external agencies to a student which are approved by concerned BOS. Upon completion of courses the departmental committee should convert the obtained grades / marks to the maximum marks assigned to that course. The controller of examinations can take a decision on such conversions and may give appropriate grades.

11. If a student drops (or terminated) from the Minor program, they cannot convert the earned credits into free or core electives; they will remain extra. These additional courses will find mention in the transcript (but not in the degree certificate). In such cases, the student may choose between the actual grade or a "pass(P)" grade and also choose to omit the mention of the course as for the following: The courses which were not done under the dropped Minors will not be shown in the transcript.

12. In case a student fails to meet the CGPA requirement for B.Tech degree with Minor at any point after registration, he/she will be dropped from the list of students eligible for degree with Minors and they will receive B.Tech degree only. However, such students will receive a separate grade sheet mentioning the additional courses completed by them.

13. Minor must be completed simultaneously with a major degree program. A student cannot earn the Minor after he / she has already earned bachelor's degree.

7.6 Industrial Collaboration (Case Study)

Institute - Industry linkages refer to the interaction between firms and universities or public research centers with the goal of solving technical problems, working on R&D, innovation projects and gathering scientific as well as technological knowledge. It involves the collaboration of Industries and Institutes in various areas that would foster the research ecosystem in the country and enhance growth of economy, industry and society at large.

The Institution is permitted to design any number of Industry oriented minor tracks as the respective BoS feels necessary. In this process the Institution can plan to have industrial collaborations in designing the minor tracks and to develop the content and certificate programs. Industry giants such as IBM, TCS, WIPRO etc., may be contacted to develop such collaborations. The Universities / Institutions shall also explore the possibilities of collaborations with major Industries in the core sectors and professional bodies to create specialized domain skills.

7.7 Mandatory Internships

1. Two summer internships each with a minimum of six weeks duration, done at the end of second and third years, respectively are mandatory. The internship can be done by the students at local industries, Govt. Organizations, construction agencies, Industries, Hydel and thermal power projects and also in software MNCs.

2. A supervisor/mentor/advisor has to be allotted to guide the students for taking up the summer internship. The supervisor shall monitor the attendance of the students while taking up the internship. Attendance requirements are as per the norms of the Institute.

3. Evaluation of the summer internships shall be through the departmental committee. A student will be required to submit a summer internship report to the concerned department and appear for an oral presentation before the departmental committee consisting of an external examiner; Head of the Department; supervisor of the internship and a senior faculty member of the department. The report and the oral presentation shall carry 40% and 60% weightages respectively.

4. It shall be evaluated for 50 external marks at the end of the semester. There shall be no internal marks for Summer Internship.

5. In the final semester, the student should mandatorily undergo internship and in parallel he/she should work on a project with well-defined objectives. At the end of the semester the candidate shall submit an internship completion certificate and a project report. A student shall also be permitted to submit project report on the work carried out during the internship. The project report shall be evaluated with an external examiner.

6. The College shall facilitate and monitor the student internship programs. Completion of internships is mandatory, if any student fails to complete internship, he/she will not be eligible for the award of degree. In such cases, the student shall repeat and complete the internship.

7.8 Skill Oriented Courses

1. For skill oriented / skill advanced course, one theory and 2 practical hours or two theory hours may be allotted as per the decision of concerned BOS.

2. Out of the five skill courses two shall be skill-oriented courses from the same domain and shall be completed in second year. Of the remaining 3 skill courses, one shall be necessarily be a soft skill course and the remaining 2 shall be skill-advanced courses either from the same domain or Job oriented skill courses, which can be of inter disciplinary nature.

3. A pool of interdisciplinary skill oriented courses shall be designed by a common Board of studies by the participating departments / disciplines and the syllabus along with the pre requisites shall be prepared for each of the laboratory infrastructure requirements. The list of such courses shall be included in the curriculum structure of each branch of Engineering, so as to enable the student to choose from the list.

4. The student shall be given an option to choose either the skill courses being offered by the college or to choose a certificate course being offered by industries / Professional bodies / APSSDC, COURSERA or any other accredited bodies as approved by the concerned BOS.

5. The Board of studies of the concerned discipline of Engineering shall review the skill advanced courses being offered by eligible external agencies and prepare a fresh list every year incorporating latest courses based on industrial demand.

6. If a student chooses to take a Certificate Course offered by industries/Professional bodies/APSSDC or any other accredited bodies, in lieu of the skill advanced course offered by the Department, the credits shall be awarded to the student upon producing the Course Completion Certificate from the agency / professional bodies

as approved by the Board of studies.

7. If a student prefers to take a certificate course offered by external agency, the department shall mark attendance of the student for the remaining courses in that semester excluding the skill course in all the calculations of mandatory attendance requirements upon producing a valid certificate as approved by the concerned Board of Studies, the student is deemed to have fulfilled the attendance requirement of the course and acquire the credits assigned to the course.

8. A committee shall be formed at the level of the college to evaluate the grades / marks given for a course by external agencies and convert to the equivalent marks / grades. The recommended conversions and appropriate grades / marks are to be approved by the Institute / Academic Council.

9. The course will be evaluated at the end of the semester for 50 marks (record: 15 marks and viva-voce: 35 marks) along with laboratory end examinations in the presence of external and internal examiner (course instructor or mentor). There are no internal marks for the skill oriented courses.

7.9 Course Numbering Scheme

The Course code consists of Eight / Nine characters. The following is the structure of the course Code (Figure 1).

Course Numbering Scheme (PVP20)

<table>
<tr><td>2</td><td>0</td><td>C</td><td>S</td><td>3</td><td>2</td><td>0</td><td>1</td><td>A</td></tr>
<tr><td colspan="2">Regulation</td><td colspan="2">Course Category</td><td>Kind of course</td><td>Semester</td><td>Type</td><td>Course Number</td><td>[Elective code]</td></tr>
<tr><td colspan="2" rowspan="8">Last two digits of Regulation offered(i.e. 20 for PVP20 regulations)</td><td colspan="2">HS-Humanities and Social Sciences including Management courses
BS-Basic Science courses
ES-Engineering Science
MC- Mandatory Courses</td><td>1. Institutional Core(i.e. HS,BS,ES,MC)</td><td rowspan="8">1-First
2-Second
3-Third
4-Fourth
5- Fifth
6-Sixth
7-Seventh
8-Eigth</td><td rowspan="6">0-Theory
1-Theory studied in MOOCS Mode
2-Integrated Course (Theory+Lab)
4- NCC/NSS
5- Practical
6-Project Work
7-Seminar</td><td rowspan="8">i.e. Course sequence Number in that semester</td><td rowspan="6">In case if the course is Elective then this field will specify the elective code (i.e A,B,C...)</td></tr>
<tr><td colspan="2">Respective Handling department code is placed</td><td>2. Open Elective/ Job Oriented Elective</td></tr>
<tr><td colspan="2">In case of Professional Core/ Professional Elective courses department code is placed:
CE-Civil Engineering
EE- Electrical & Electronics Engineering
ME- Mechanical Engineering
EC- Electronics and Communication Engineering
CS- Computer Science & Engineering
IT- Information Technology
AM-CSE(Artificial Intelligence & Machine Learning)
DS-CSE(Data Science)</td><td>3. Professional Core
4. Professional Elective</td></tr>
<tr><td colspan="2">Respective chosen minor department code is placed</td><td>5. Minor Course</td></tr>
<tr><td colspan="2">Respective department code is placed</td><td>6. Honors Course</td></tr>
<tr><td colspan="2">Respective Handling department code is placed</td><td>7. Humanities and Social Science Elective</td></tr>
<tr><td colspan="2" rowspan="2">SO- Skill Oriented Course
SA- Skill Advanced Course
SS- Soft Skill Course</td><td rowspan="2">8. Skill Oriented/ Skill Advanced/ Soft Skill Course</td><td>8. Summer/ Industrial/ Research Internship</td><td>A - Summer
B – Industrial
C - Research</td></tr>
<tr><td>9. Community Service Project</td><td></td></tr>
</table>

Figure 1: Course numbering scheme

7.10 Medium of Instruction and Examination

The medium of instruction and examinations shall be English.

7.11 Registration

Every student has to register himself/herself for the courses in each semester individually at the time as specified in academic calendar.

8. Choice Based Credit System (CBCS)

Choice Based Credit System (CBCS) shall be introduced with effect from 2019-20 academic years, based on guidelines of the statutory bodies in order to promote:

- Activity based learning
- Student centered learning
- Students to choose courses of their choice
- Learning at their own pace

Flexibility is extended to the fast learning students to take the courses of higher semesters in advance as per their convenience to concentrate on their placement activity/ project work, etc., during the VII/VIII semesters.

8.1 CBCS Course Registration Policy

Fast learning students can register for additional courses from higher semesters by satisfying the pre-requisite course(s) to a maximum of 8 credits in each of the semesters from III semester onwards along with the regular semester courses as prescribed. There is no minimum limit to the credits for taking additional courses.

Eligibility for choosing CBCS flexibility:

- **Regular Students (4 Year duration),** entering the n^{th} semester with no backlog courses up to $(n-1)^{th}$ semester, are only eligible to opt for this flexibility.
- **Lateral entry students (3 year duration)** with 70% Marks in their Diploma are eligible to opt for this flexibility during III and IV Semesters. Those students entering into V/ VI /VII semester with no backlog courses up to $(n-1)^{th}$ semester, are only eligible to opt for this flexibility.

  The list of additional courses offered in the even & odd semesters, registration dates will be notified by the respective departments well in advance.

  A student can withdraw from the respective course within 15 days after the commencement of the course.

  The choice of utilizing this flexibility is purely optional to the students.

  A minimum number of students required to register for an additional course shall be twenty (20). In case, the registered strength for the additional course is less than twenty (20), the course may be offered on the recommendation of the Head of the Department and subsequent approval of the Principal.

8.2 Continuous Internal Evaluation (CIE) for CBCS opted Courses

The contact hours, continuous assessment pattern, eligibility criteria to write end semester examinations and revaluation scheme for these additional courses will be as per the current academic regulations [PVP20].

8.3 Eligibility to appear CBCS registered courses for Semester End Examinations

The registered additional courses will be dealt separately as individual courses for the calculation of attendance and continuous assessment of marks for assessing the eligibility to write the end semester examinations for these courses.

The performance of the student in the registered additional courses will be separately mentioned in the semester end grade card and it will not be taken into account for the calculation of the SGPA for that semester.

The performance of the student in the registered additional courses will be taken into account in the corresponding semesters.

8.4 CBCS Course Detention

8.4.1 In case, the student is detained for want of minimum specified attendance and continuous assessment marks criterion either in the regular semester or in the additional courses, he/she will forfeit the eligibility for registering additional courses from that semester onwards. However, the additional courses completed by the students in the earlier semesters will be valid and taken into consideration.

8.4.2 In case, the student is detained for want of minimum specified attendance and continuous assessment marks criterion in the regular semester but meets minimum specified attendance and continuous assessment marks criterion in the registered additional courses, he/she shall write the end semester examinations for these additional courses along with the regular students in the corresponding semester only.

8.4.3 In case, the student fails / is absent in the end semester examinations of the registered additional courses or in the regular semester courses in a particular semester, he will forfeit the eligibility for registering additional courses from that semester onwards. However, the additional courses completed by the students in the earlier semesters will be valid and taken into consideration. They can write the end semester examinations for additional courses in which they failed/were absent, along with regular students in the corresponding semesters only.

8.4.4 The criterion for the promotion to higher semesters will be as per PVP20 regulations, taking only the regular semester courses into consideration for the fast learners.

8.4.5 Additional courses, in which the fast learning student fails, will not be considered as backlogs for them.

8.4.6 The fast learning students shall register for all the courses of a regular semester excluding the courses completed in the previous semesters.

8.4.7 The credits scored by students through CBCS subjects shall not be considered for credit promotion from II year to III year or from III year to IV year B.Tech.

8.4.8 The student opting for the said flexibility will be considered for the award of the division on par with other regular students.

8.4.9 The students who have earlier history of indulging in malpractices in semester end examinations are not eligible for opting CBCS.

8.4.10 If the student fails to register for opted CBCS courses for semester end examination, he/she will forfeit the eligibility for registering additional courses from that semester onwards and marks secured through continuous assessment will not be considered.

8.4.11 The choice of utilizing this flexibility is purely optional to the students.

8.4.12 If a student fails/absent in a CBCS course, he/she is bound to appear in the same course when studied in regular semester.

9 EXAMINATIONS & SCHEME OF EVALUATION

9.1 Description of Evaluation

1. **Continuous Internal Evaluation (CIE):** The performance of the student in each course is evaluated by the faculty/course coordinator all through the semester; with mid-term tests (sessional-1and sessional-2), assignments, project reviews, viva-voce, laboratory assessment and other means covering the entire syllabus of the course.

2. **Semester End Examination (SEE):** It shall be conducted by chief controller of examinations at the end of each semester, as per the academic calendar and with a written examination for theory courses and practical/project examination with built-in oral part for laboratory/project.

9.2 Continuous Internal Evaluation (CIE)

9.2.1 Theory Courses

a) For theory subjects, during a semester, there shall be two mid-term examinations. Each mid-term examination consists of (i) one objective examination (20 multiple choice questions) for 10 marks for duration of 20 minutes (ii) one descriptive examination (3 full questions for 5 marks each) for 15 marks for duration of 90 minutes and (iii) one assignment for 5 marks. Mid-1 shall be conducted from first 50% of the syllabi.

b) In the similar lines, the second objective, descriptive examinations, assignment shall be conducted on the rest of the 50% syllabus.

c) The total marks secured by the student in each mid-term examination are evaluated for 30 marks. The first mid marks (Mid-1) consisting of marks of objective examination, descriptive examination and assignment shall be submitted by the concerned teacher to the department examination section within one week after completion of first mid examination.

d) The mid marks submitted to the department examination section shall be displayed in the concerned department notice boards for the benefit of the students.

e) If any discrepancy found in the submitted Mid-1 marks, it shall be brought to the notice of Head of the department within one week from the submission.

f) Second mid marks (Mid-2) consisting of marks of objective examination, descriptive Examination and assignment shall also be submitted by the concerned teacher to the department examination section within one week after completion of second mid examination and it shall be displayed in the notice boards. If any discrepancy found in the submitted mid-2 marks, it shall be brought to the notice of Head of the department within one week from the submission.

g) Internal marks can be calculated with 80% weightage for better of the two mids and 20% Weightage for other mid exam.

Example:

Mid-1 marks = Marks secured in (Objective-1+Descriptive examination-1 +Assignment-1)

Mid-2 marks = Marks secured in (Objective-2+Descriptive examination-2 +Assignment-2)

Final internal Marks = (Best of (Mid-1/Mid-2) marks x 0.8

+ Least of (Mid-1/Mid-2) marks x 0.2)

h) With the above criteria, concerned departments have to display the consolidated marks obtained by the students in the department notice boards. If any discrepancy found, it shall be brought to the notice of Head of the department through proper channel within one week with all proofs.

9.2.2 Mandatory Learning Courses

Mandatory Course (M.C): Environmental Sciences, Universal Human Values, Ethics, Indian Constitution, Essence of Indian Traditional Knowledge, Life Sciences for Engineers, etc. non-credit (zero credits) mandatory courses. Environmental Sciences shall be offered compulsorily as mandatory course for all branches. A minimum of 75% attendance is mandatory in these subjects. There shall be an external examination for 70 marks and it shall be conducted by the college internally. Two internal examinations shall be conducted for 30 marks and a student has to secure at least 40% of the marks for passing the course. No marks or letter grade shall be printed in the transcripts for all mandatory non-credit courses, but only Completed (Y)/Not-completed (N) will be specified.

9.2.3 Drawing Based Courses:

For the subject having design and / or drawing, (such as Engineering Graphics, Engineering Drawing, Machine Drawing) and estimation, the distribution shall be 30 marks for internal evaluation (15 marks for continuous Assessment (day–to–day work) and 15 marks for internal tests) and 70 marks for end examination. There shall be two internal tests in a Semester for 15 marks each and final marks can be calculated with 80% weightage for better of the two tests and 20% weightage for other test and these are to be added to the marks obtained in day to day work.

9.2.4 Laboratory Courses

For practical subjects there shall be continuous evaluation during the semester for 15 internal marks and 35 end examination marks. The internal 15 marks shall be awarded as follows: day today work - 5 marks, Record-5 marks and the remaining 5 marks to be awarded by conducting an internal laboratory test. The end examination shall be conducted by the teacher concerned and external examiner appointed.

Table: Distribution of Marks (CIE)

S. No.	Criterion	Marks
1	Day to Day Evaluation	5
2	Record	5
3	Internal Examination	5

9.2.5 MOOCs Courses

There shall be a Discipline Centric Elective Course through Massive Open Online Course (MOOC) as Program Elective course. The student shall register for the course (Minimum of 12 weeks) offered by SWAYAM/NPTEL through online with the approval of Head of the Department. The Head of the Department shall appoint one mentor for each of the MOOC subjects offered. The student needs to register the course in the SWAYAM/NPTEL portal. During the course, the mentor monitors the student’s assignment submissions given by SWAYAM/NPTEL. The student needs to submit all the assignments given and needs to take final exam at the proctor center. The student needs to earn a certificate by passing the exam. The student will be awarded the credits given in curriculum only by submission of the certificate. In case if student does not pass subjects registered through SWAYAM/NPTEL, the same or alternative equivalent subject may be registered again through SWAYAM/NPTEL in the next semester with the recommendation of HOD and shall pass.

9.3 Semester End Examination (SEE)

9.3.1 Theory Courses:

a) The semester end examinations will be for 70 marks consisting of five questions carrying 14 marks each. Each of these questions is from one unit and may contain sub-questions. For each question there will be an “either” “or” choice, which means that there will be two questions from each unit and the student should answer either of the two questions.

b) The job oriented skill courses may be registered at the college or at any accredited external agency. A student shall submit a record/report on the on the list skills learned. If the student completes job oriented skill course at external agency, a certificate from the agency shall be included in the report. The course will be evaluated at the end of the semester for 50 marks (record: 15 marks and viva-voce: 35 marks) along with laboratory end examinations in the presence of external and internal examiner (course instructor or mentor). There are no internal marks for the job oriented skill courses.

9.3.2 Laboratory Courses: 35 marks

i. The Semester end examination for laboratory courses shall be conducted with three hour duration at the end of semester for 35 marks as given below:

Table : Distribution of Marks (SEE)

S.No.	Criterion	Marks
1	Procedure	5
2	Experiment / Programme Execution	15
3	Result	10
4	Viva-Voce	5

ii. Each Semester end Laboratory Examination shall be conducted by an External Examiner along with the Internal Examiner.

9.3.3 Internship: 50 Marks (Only External marks)

Evaluation of the summer internships: It shall be completed in collaboration with local industries, Govt. Organizations, construction agencies, Industries, Hydel and thermal power projects and also in software MNCs in the area of concerned specialization of the UG programme. Students shall pursue this course during summer vacation just before its offering as per course structure. The minimum duration of this course is at least 6 weeks. The student shall register for the course as per course structure after commencement of academic year. A supervisor / mentor / advisor have to be allotted to guide the students for taking up the summer internship. The supervisor shall monitor the attendance of the students while taking up the internship. Attendance requirements are as per the norms of the Institute. After successful completion, students shall submit a summer internship technical report to the concerned department and appear for an oral presentation before the departmental committee consists of an external examiner; Head of the Department; supervisor of the internship and a senior faculty member of the department. A certificate from industry / skill development center shall be included in the report. The report and the oral presentation shall carry 40% and 60% weightages respectively. It shall be evaluated for 50 external marks at the end of the semester. There shall be no internal marks for Summer Internship. A student shall secure minimum 40% of marks for successful completion. In case, if a student fails, he/she shall reappear as and when semester supplementary examinations are conducted by the Institute.

9.3.4 Community Service Project (CSP): 100 Marks

Report on CSP should be submitted by each student. An internal Viva shall also be conducted by a committee constituted by the Principal of the college. The assessment is to be conducted for 100 marks. The number of credits assigned is 4. Later the marks are converted into grades and grade points to include finally in the SGPA and CGPA. A student shall secure minimum 40% of marks for successful completion. In case, if a student fails, he/she shall reappear as and when semester supplementary examinations are conducted by the Institute. The students must do the community service project in the vacation period after I-II.

The weightings shall be:

Activity Log 20% CSP Implementation 30%

Report 25% Presentation 25%

For Complete details: https://www.jntuk.edu.in/jntuk-dap-community-service-project-guidelines-reg/

9.3.5 Major Project

(Project - Project work, seminar and internship in industry):

In the final semester, the student should mandatorily register and undergo internship and in parallel he/she should work on a project with well-defined objectives. At the end of the semester the candidate shall submit an internship completion certificate and a project report. A student shall also be permitted to submit project report on the work carried out during the internship. The project report shall be evaluated with an external examiner.

Evaluation: The total marks for project work for **200 marks** and distribution shall be **60 marks for internal** and **140 marks** for **external** evaluation. The supervisor assesses the student for 30 marks (Report: 15 marks, Seminar: 15 marks). At the end of the semester, all projects shall be showcased at the department for the benefit of all students and staff and the same is to be evaluated by the departmental Project Review Committee consisting of supervisor, a senior faculty and HOD for 30 marks. The external evaluation of Project Work is a Viva-Voce Examination conducted in the presence of internal examiner and external examiner and is evaluated for 140 marks.

9.4 Conditions for Pass Marks

I. Paper setting and evaluation of the answer scripts shall be done as per the procedures laid down by the Institution Examination section from time to time.

II. To maintain the quality, external examiners and question paper setters shall be selected from premier institutes and Universities, NITs, Autonomous colleges.

III. For non-credit mandatory courses, like Life sciences for Engineers, Environmental Sciences, Universal Human Values, Ethics, Indian Constitution, Essence of Indian Traditional Knowledge, the student has to secure 40% of the marks allotted in the internal evaluation for passing the course. No marks or letter grade shall be allotted for all mandatory non-credit courses.

IV. A student is deemed to have satisfied the minimum academic requirements if he has earned the credits allotted to each theory/practical design/drawing subject/ project etc by securing not less than 35% of marks in the end semester exam and minimum 40% of marks in the sum total of the internal marks and end semester examination marks together.

V. **Distribution and Weightage of marks**:

The assessment of the student's performance in each course will be as per the details given

SNo	Component	Internal	External	Total
1	Theory	30	70	100
2	Lab	15	35	50
3	Mandatory	30	70	100
4	Drawing	30	70	100
5	Project	60	140	200
6	Mini Project/Internship/Industrial Training / Skill Development Programs/Research Project	-	50	50

9.5 Revaluation

9.5.1 Continuous Internal Evaluation

The continuous Evaluation scripts shall be shown to the students before finalizing the marks. However, if the student has any concern, not addressed before the finalization of marks, he/she may submit the application for revaluation to the concerned head of the department. The Head of the Department may constitute a two-member committee for re-evaluating the script. The evaluation of the committee is final and binding.

9.5.2 Semester End Examination

1. As per the notification issued by the Controller of Examinations, the students can submit the applications for revaluation, along with the requisite fee receipt for revaluation of his/her answer script(s) of theory course(s), if he/she is not satisfied with the marks obtained.
2. The Controller of Examinations shall arrange for re-evaluation of those answer script(s).
3. A new external examiner, other than the first examiner, shall re-evaluate the answer script(s).
4. Revaluation marks will be taken into consideration only if the difference between the two valuations is more than or equal to 15%. Better marks between the two shall be taken into consideration. However, if the revaluation marks facilitates passing of the candidate, then the revaluation marks will be considered even if the difference of marks is less than 15%.
5. If the difference of marks between the two valuations is more than 20%, the answer script will be referred to third valuation. The average of nearest two marks will be awarded.

9.6 Withholding of Results

If the student has not paid the dues to the college, or if any case of malpractice or indiscipline is pending against him, the result of the student will be kept as withheld and he/she will not be allowed to enter the next semester. His/her degree shall be considered as withheld in such cases.

10 CRITERIA TO ATTEND SEMESTER END EXAMINATION AND PROMOTION TO HIGHER SEMESTER

10.1 Eligibility for Semester End Examinations

10.1.1 Students shall put in a minimum average attendance of 75% in the courses. computed by totalling the number of periods of lectures, tutorials, drawing, practical and project work as the case may be, held in every course as the denominator and the total number of periods attended by the student in all the courses put together as the numerator, to be eligible to write semester end examinations.

10.1.2 Condonation of shortage in attendance may be recommended by respective Heads of Departments on genuine medical grounds, provided the student puts in at least 65% attendance as calculated above and provided the Principal is satisfied with the genuineness of the reasons and the conduct of the student.

10.1.3 Students, having more than 65% and less than 75% of attendance, shall have to pay requisite fee towards condonation.

10.2 Promotion Rules

1. A student shall be promoted from first year to second year if he fulfills the minimum attendance requirements.

2. A student will be promoted from II year to III year if he fulfills the academic requirement of 40% of credits up to either II year I-Semester or II year II-Semester from all the examinations, whether or not the candidate takes the examinations and secures prescribed minimum attendance in II year II semester.
3. A student shall be promoted from III year to IV year if he fulfills the academic requirements of 40% of the credits up to either III year I semester or III year II semester from all the examinations, whether or not the candidate takes the examinations and secures prescribed minimum attendance in III year II semester.

11. SUPPLEMENTARY EXAMINATIONS

1. General

Semester end Supplementary examinations shall be conducted along with regular semester end examinations.

2 Advanced Supplementary Exams

Candidate(s), who fails in Theory or Laboratory courses of VIII semester, can appear for advanced supplementary examination conducted within one month after declaration of the revaluation results. However, those candidates who fail in the advanced supplementary examinations of VIII semester shall appear for subsequent examinations along with regular candidates conducted at the end of the respective academic year.

12. READMISSION CRITERIA

A candidate, who is detained in a semester due to lack of attendance/credits, has to obtain written permission from the Principal for readmission into the same semester after duly fulfilling all the required norms stipulated by the college in addition to paying an administrative fee of **Rs. 1,000/-**

Rules for calculation of attendance for readmitted students

a) Number of classes conducted shall be counted from the commencement day of the semester concerned, irrespective of the date of payment of tuition fee.

b) They shall submit a written request to the principal of the college, along with a challan paid towards tuition and other fee, for readmission before the commencement of the class work.

c) They can get the information regarding date of commencement of class work for each semester that will be made available in the college notice boards/website from time to time.

13 BREAK IN STUDY

Student, who discontinues the studies for valid reason permitted by the principal, shall get readmission into appropriate semester of B.Tech. programme after break-in study, with the prior permission of the Principal and following the transitory regulations applicable to such batch in which he/she joins. An administrative fee of **Rs**. 1**000/-**per each year of break in study, in addition to the prescribed tuition and special fee has to be paid by the candidate to condone his/her break in study.

14 GAP YEAR

Gap Year – concept of Student Entrepreneur in Residence shall be introduced and outstanding students who wish to pursue entrepreneurship are allowed to take a break of one year at any time after I year/II year/III year to pursue entrepreneurship full time. This period shall be counted for the maximum time for graduation. An evaluation committee at Institution level shall be constituted to evaluate the proposal submitted by the student and the committee shall decide on permitting the student for availing the Gap Year.

15 TRANSITORY REGULATIONS

A candidate, who is detained or discontinued in a semester, on re-admission, the academic regulations under which he/she has originally admitted will continue to be applicable to him/her on re-admission.

16 ELIGIBILITY FOR AWARD OF B.TECH DEGREE

1. The B.Tech. Degree shall be conferred on a candidate who satisfies the following requirements.

   a) A Regular student (four year programme) shall register and secure himself/herself for **160** Credits

   b) A Lateral Entry student (three year programme) shall register and secure himself/herself for**12**1 credits

2. **Award of Division**

   The criteria for award of division, after successful completion of programme are as shown in Table:

Table : Criteria for Award of Division

Class Awarded	CGPA to be secured	Remarks
First class with distinction	≥7.75 (Without any supplementary appearance)	From the CGPA secured from 160 credits
First class	≥6.75	
Second class	≥5.75 to <6.75	
Pass Class	≥5.00 to <5.75	

- Awarded only if all the courses prescribed are cleared in single attempt within four years for regular candidates and three years for lateral entry candidates
- Detained and break-in study candidates are not eligible for the award of First Class with Distinction
- The cases of students who are absent for semester end examination only once in his/her duration of B.Tech. Programme on valid medical grounds/humanitarian grounds shall also be considered for the award of First class with Distinction subject to the recommendations of the committee constituted by the Principal.

For the purpose of awarding First, Second and Pass Class CGPA obtained in the examinations appeared within the maximum period allowed for the completion of the programme shall be considered.

Consolidated Grade Card

A consolidated grade card containing credits & grades obtained by the students will be issued after successful completion of the four year B.Tech Programme.

17 CONDUCT AND DISCIPLINE

1. Students shall conduct themselves within and outside the premises of the Institute in a manner befitting the students of our Institution.

2. As per the order of Honorable Supreme Court of India and AICTE guidelines, ragging in any form is considered a criminal offence and is banned. Ragging within or outside any educational institution is prohibited. Ragging means doing an act, that causes or is likely to cause insult or annoyance or fear of apprehension or threat or intimidation or outrage of modesty or injury to a student. Any form of ragging will be severely dealt with as per AP Prohibition of Ragging Act-1997 section-4.

Table : Punishments for Ragging

Nature of ragging	Punishment
Teasing, embarrassing and humiliating	Imprisonment up to 6 months or fine up to Rs.1,000/- or both
Assaulting or using criminal force or criminal intimidation	Imprisonment up to 1 year or fine up to Rs.2,000/- or both
Wrongfully restraining or confining or causing hurt	Imprisonment up to 2 years or fine up to Rs.5,000/- or both
Causing grievous hurt kidnapping or raping or committing unnatural offence	Imprisonment up to 5 years and fine up to Rs.10,000/-
Causing death or abetting suicide	Imprisonment up to 10 years and fine up to Rs.50,000/-

3. A student who is convicted of an offence and punished with imprisonment for a term of more than six months shall not be admitted into the institution.

4. Whenever any student complains of ragging to the head or manager of an educational institution, such head or manager should inquire into the complaint and if the complaint is prima-facie found true, should suspend the student or students complained against.

5. If the head or manager of an educational institution fails or neglects to take action in the manner specified in the Act, the person shall be deemed to have abetted the offence and shall be punished with the punishment provided for the offence.

6. If a student commits suicide due to or in consequence of ragging, the person who commits such ragging shall be deemed to have abetted such suicide.

7. The following acts of omission and/or commission shall constitute gross violation of the code of conduct and are liable to invoke disciplinary measures.

i. Lack of courtesy and decorum; indecent behaviour anywhere within or outside the campus

ii. Possession, consumption or distribution of alcoholic drinks or any kind of narcotics or hallucinogenic drugs.

The following activities are not allowed within the campus:

- Mutilation or unauthorized possession of library books.
- Noisy and unseemly behaviour, disturbing studies of fellow students.
- Hacking computer systems (such as entering into other person's areas without prior permission, manipulation and/or damage of computer hardware and software or any other cybercrime etc.)
- Use of mobile phones.
- Plagiarism of any nature.
- Any other act of gross indiscipline as decided by the Institute from time to time.
- Commensurate with the gravity of offense, the punishment may be reprimand, fine, expulsion from the institute/ hostel, debarment from a examination, disallowing the use of certain facilities of the Institute, rustication for a specified period or even outright expulsion from the Institute, or even handing over the case to appropriate law enforcement authorities or the judiciary, as required by the circumstances.
- For an offence committed in (i) a hostel, (ii) a department or in a class room and (iii) elsewhere, the Chief Warden, the Head of the Department and the Principal, respectively, shall have the authority to reprimand or impose fine.
- Cases of adoption of unfair means and/or any malpractice in an examination shall be reported to the Principal for taking appropriate action.
- Unauthorized collection of money in any form is strictly prohibited.
- Detained and break-in-study candidates are allowed into the campus for academic purposes only with the permission from authorities.
- Misconduct committed by a student outside the Institute campus but having the effect of damaging, undermining & tarnishing the image & reputation of the institution will make the student concerned liable for disciplinary action commensurate with the nature and gravity of such misconduct.
- The disciplinary action committee constituted by the Principal, shall be the authority to investigate the details of the offence, and recommend disciplinary action based on the nature and extent of the offence committed.
- Grievance redressal committee, constituted by the Principal, shall deal with all grievances pertaining to the academic/ administrative and disciplinary matters.
- All the students must abide by the code and conduct rules of the Institute.

18 MALPRACTICES

The Principal shall refer the cases of malpractices by students in internal assessment tests and end semester examinations, to a malpractice enquiry committee constituted for the purpose. The committee shall follow the approved scales of punishment.
The committee consists of:

1. Heads of Department (Three)
2. Controller of Examinations
3. Assistant Controller of Examinations

Table – 10: Disciplinary action for malpractices/improper conduct in examinations

	Nature of Malpractices/Improper conduct	Punishment

1 (a)	If the candidate possesses or keeps accessible, any paper, note book, programmable calculators, mobile phones, pager, palm computers or any other form of material concerned with or related to the subject of the examination (theory or practical) in the examination hall but has not made use of (material shall include any marks on the student's body that can be used as an aid in the subject of the examination)	Expulsion from the examination hall and cancellation of the performance in that subject only.
(b)	If the candidate gives assistance or guidance or receives it from any other candidate orally or by any other body language methods or communicates through mobile phones with any candidate or persons in or outside the exam hall in respect of any matter.	Expulsion from the examination hall and cancellation of the performance in that subject only of all the candidates involved. In case of an outsider, he will be handed over to the police and a case is registered against him.
2	If the candidate has copied in the examination hall from any paper, book, programmable calculators, palm computers or any other form of material relevant to the subject of the examination (theory or practical) in which the candidate is appearing.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work. He shall not be permitted to appear for the remaining examinations of the subjects of that semester/year. The hall ticket of the candidate is to be cancelled.
3	If the candidate impersonates any other candidate in connection with the examination.	The candidate who has impersonated shall be expelled from examination hall. The candidate is also debarred and forfeits the seat. The performance of the original candidate, who has been impersonated, shall be cancelled in all the subjects of the examination (including practicals and project work) already appeared and shall not be allowed to appear for examinations of the remaining subjects of that semester/year. The candidate is also debarred for two consecutive semesters from class work and all University examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat. If the imposter is an outsider, he will be handed over to the police and a case is registered against him.
4	If the candidate smuggles in an answer book or additional sheet or takes out or arranges to send out the question paper during the examination or answer book or additional sheet, during or after the examination.	Expulsion from the examination hall and cancellation of performance in that subject and all the other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that

		semester/year. The candidate is also debarred for two consecutive semesters from class work and all other examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat.
5	If the candidate uses objectionable, abusive or offensive language in the answer paper or in letters to the examiners or writes to the examiner requesting him to award pass marks.	Cancellation of the performance in that subject.
6	If the candidate refuses to obey the orders of the Chief Superintendent/Assistant - Superintendent / any officer on duty or misbehaves or creates disturbance of any kind in and around the examination hall or organizes a walk out or instigates others to walk out, or threatens the officer-in charge or any person on duty in or outside the examination hall of any injury to his person or to any of his relations whether by words, either spoken or written or by signs or by visible representation, assaults the officer-in-charge, or any person on duty in or outside the examination hall or any of his relations, or indulges in any other act of misconduct or mischief which results in damage to or destruction of property in the examination hall or any part of the Institute campus or engages in any other act which in the opinion of the officer on duty amounts to use of unfair means or misconduct or has the tendency to disrupt the orderly conduct of the examination.	In case of students of the Institute, they shall be expelled from examination halls and cancellation of their performance in that subject and all other subjects the candidate(s) has (have) already appeared and shall not be permitted to appear for the remaining examinations of the subjects of that semester/year. The candidates also are debarred and forfeit their seats. In case of outsiders, they will be handed over to the police and a police case is registered against them.
7	If the candidate leaves the exam hall taking away answer script or intentionally tears of the script or any part thereof inside or outside the examination hall.	Expulsion from the examination hall and cancellation of performance in that subject and all the other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred for two consecutive semesters from class work and all other examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat.

8	If the candidate possesses any lethal weapon or firearm in the examination hall.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred and forfeits the seat.
9	If student of the Institute, who is not a candidate for the particular examination or any person not connected with the Institute indulges in any malpractice or improper conduct mentioned in clause 6 to 8.	Student of the Institute: Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work. He shall not be permitted for the remaining examinations of the subjects of that semester/ year. The candidate is also debarred and forfeits the seat. Person(s) who do not belong to the Institute: Will be handed over to police and a police case will be registered against them.
10	If the candidate comes in a drunken condition to the examination hall.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work. He shall not be permitted for the remaining examinations of the subjects of that semester/year.
11	Copying detected on the basis of internal evidence, such as, during valuation or during special scrutiny.	Cancellation of the performance in that subject and all other subjects the candidate has appeared including practical examinations and project work of that semester/year examinations.
12	If any malpractice is detected which is not covered in the above clauses 1 to 11, shall be awarded suitable punishment.	

Note: Special squads may be formed to oversee the proper conduct of examinations.

19 OTHER MATTER

19.1 Scribe facility is extended to B Tech students strictly following the guidelines issued under F. No. 16-110/2003-DD.III Dt. 26-02-2013 by the Ministry of Social Justice and Empowerment, Department of Disability Affairs, Govt. of India.

19.2 Students who are suffering from contagious diseases are not allowed to appear either continuous internal assessment or semester end examinations

19.3 The students who participate in coaching/tournaments held at State/National/International levels through University/Indian Olympic Association during semester end examination period will be promoted to subsequent semesters till the entire programme is completed as per the guidelines of University Grants Commission Letter No. F.1-5/88 (SPE/PES), dated18-08-1994.

19.4 Based on the recommendations of HOD & Principal, exemption from attending the class work shall be given to those students who secure placement and intend to join as the employer in VIII semester of B.Tech. Special Continuous Internal Evaluation (Assignment Tests, Sessional, etc.,) will be arranged to such candidates separately if necessary. However, they shall appear for Semester End Examinations as per the Academic Calendar

19.5 The Principal shall deal with any academic problem, which is not covered under these rules and regulations, in consultation with the Heads of the Departments in an appropriate manner, and subsequently such actions shall be placed before the academic council for ratification. Any emergency modification of regulation, approved in the Heads of the Departments Meetings, shall be reported to the academic council for ratification.

20 GENERAL

1 Wherever the words “he”, “him”, “his”, occur in the regulations, they may include “she”, “her”, “hers”.
2 The academic regulations should be read as a whole for the purpose of any interpretation.
3 In case of any doubt or ambiguity in the interpretation of above rules, the decision of the principal is final.

21 INSTITUTE RULES AND REGULATIONS

1 Use of **Mobile phones** is strictly prohibited inside the Institute academic area.

2 Students should come to Institute in **proper dress**.

3 All students should wear **Identity cards** in the Institute premises.

4 Students should be present in their respective classrooms **before the commencement of class sharply**.

5 Students should not leave the Institute premises without prior permission of their respective Heads of the departments during Institute working hours.

6 Students should maintain silence in the class rooms during working periods.

7 Sitting / wandering of the students at the stair cases, corridors, cycle stands or the areas within the Institute premises is strictly prohibited.

8 Usage of Vehicle horn inside the Institute premises is prohibited.

22 AMENDMENTS TO REGULATIONS

The Academic Council may, from time to time, revise, amend or change the regulations, schemes of examination and/or syllabi.

Oratory

PRINCIPAL

COURSE STRUCTURE
AND
SYLLABUS

Prasad V. Potluri Siddhartha Institute of Technology

DEPARTMENT OF INFORMATION TECHNOLOGY

Course Structure for B. Tech (IT) Students under PVP20 Regulations

(Effective from Academic Year 2020-21)

I B.Tech I Semester

Sl. No	Course Code	Course Title	Hours Per week			Credits	CIE	SEE	Total marks
			L	T	P	C			
1	20HS1101	Communicative English I	3	0	0	3	30	70	100
2	20BS1101	Calculus and Linear Algebra	3	0	0	3	30	70	100
3	20BS1103	Engineering Physics	3	0	0	3	30	70	100
4	20ES1101	Basic Electrical and Electronics Engineering	3	0	0	3	30	70	100
5	20ES1103	Problem Solving Techniques	3	0	0	3	30	70	100
6	20HS1151	Communicative English I Lab	0	0	3	1.5	15	35	50
7	20BS1152	Engineering Physics Lab	0	0	3	1.5	15	35	50
8	20ES1151	Basic Electrical and Electronics Engineering Lab	0	0	3	1.5	15	35	50
Total			**15**	**0**	**9**	**19.5**	**195**	**455**	**650**

I B.Tech II Semester

Sl. No	Course Code	Course Title	Hours Per week			Credits	CIE	SEE	Total marks
			L	T	P	C			
1	20HS1201	Communicative English II	3	0	0	3	30	70	100
2	20BS1202	Engineering Chemistry	3	0	0	3	30	70	100
3	20BS1204	Probability and Statistics	3	0	0	3	30	70	100
4	20ES1202	Programming for Problem Solving	3	0	0	3	30	70	100
5	20ES1204	Engineering Graphics	1	0	4	3	30	70	100
6	20HS1251	Communicative English II Lab	0	0	3	1.5	15	35	50
7	20BS1251	Engineering Chemistry Lab	0	0	3	1.5	15	35	50
8	20ES1253	Programming for Problem Solving Lab	0	0	3	1.5	15	35	50
9	20MC1201	Life Sciences for Engineers	2	0	2	0	30	70	100
10	20MC1241A/ 20MC1241B	NSS/NCC	0	0	2	0	Completed/Not Completed		
Total			**15**	**0**	**17**	**19.5**	**225**	**525**	**750**

II B.Tech I Semester

Sl. No	Course Code	Course Title	Hours Per week			Credits	CIE	SEE	Total marks
			L	T	P	C			
1	20BS1303	Engineering Mathematics III (Discrete Mathematical Structures)	3	0	0	3	30	70	100
2	20ES1305	Data Structures	3	0	0	3	30	70	100
3	20IT3301	Fundamentals of Digital Logic Design	3	0	0	3	30	70	100
4	20IT3302	Software Engineering	3	0	0	3	30	70	100
5	20IT3303	Object Oriented Programming through C++	3	0	0	3	30	70	100
6	20ES1356	Data Structures Lab	0	0	3	1.5	15	35	50
7	20IT3351	Software Engineering Lab	0	0	3	1.5	15	35	50
8	20IT3352	Object Oriented Programming through C++ Lab	0	0	3	1.5	15	35	50
9	20SO8356	UX Design	1	0	2	2	--	50	50
10	20MC1301	Environmental Science	2	0	0	0	30	70	100
11	20IT3391	Community Service Project	0	0	0	4	100	-	100
12	20MC1341A/ 20MC1341B	NSS/NCC	0	0	2	0	Completed/Not Completed		
Total			**18**	**0**	**13**	**25.5**	**325**	**575**	**900**

II B.Tech II Semester

Sl. No	Course Code	Course Title	Hours Per week			Credits	CIE	SEE	Total marks
			L	T	P	C			
1	20BS1404	Transform Techniques, Numerical Methods& Number Theory	3	0	0	3	30	70	100
2	20IT3401	Database Management System	3	0	0	3	30	70	100
3	20IT3402	Computer Organization	3	0	0	3	30	70	100
4	20IT3403	Design and Analysis of Algorithms	3	0	0	3	30	70	100
5	20IT3404	Programming with Java	3	0	0	3	30	70	100
6	20IT3451	Database Management System Lab	0	0	3	1.5	15	35	50
7	20IT3452	Design and Analysis of Algorithms Lab	0	0	3	1.5	15	35	50
8	20IT3453	Programming with Java Lab	0	0	3	1.5	15	35	50
9	20SO8455	Python Programming	1	0	2	2	--	50	50
10	20MC1401	Universal Human Values	2	0	0	0	30	70	100
Total			**18**	**0**	**11**	**21.5**	**225**	**575**	**800**
Summer Internship(Mandatory) 4-6 weeks during Summer vacation									
11	20IT5401	Operating Systems (Minor)	4	0	0	4	30	70	100
12	(Honors) 20IT6401	Cyber Security & Ethical Hacking	4	0	0	4	30	70	100
	20IT6401	Object Oriented Modelling and Design	4	0	0	4	30	70	100
	20IT6401	Cryptography	4	0	0	4	30	70	100
	20IT6401	Bioinformatics	4	0	0	4	30	70	100

III B.Tech I Semester

Sl. No	Course Code	Course Title	Hours Per week			Credits	CIE	SEE	Total marks
			L	T	P	C			
1	20IT3501	Operating Systems	3	0	0	3	30	70	100
2	20IT3502	Web Technologies	3	0	0	3	30	70	100
3	20IT3503	Computer Networks	3	0	0	3	30	70	100
		Open Elective -I							
4	20IT2501A	offered by IT to other Branches 1. Cyber Laws	3	0	0	3	30	70	100
	20CE2501A	offered by other branches Air Pollution and Control	3	0	0	3	30	70	100
	20EC2501A	Sensor Technology	3	0	0	3	30	70	100
	20EC2501B	Electronic Instrumentation	3	0	0	3	30	70	100
	20EE2501A	Electrical Safety	3	0	0	3	30	70	100
	20ME2501A	Design Thinking	3	0	0	3	30	70	100
	20ME2501B	Logistics and Supply Chain Management	3	0	0	3	30	70	100
	20CS250A	Programming with C (not for IT students)	3	0	0	3	30	70	100
		Professional Elective-I							
5	20IT4501A	Information Security	3	0	0	3	30	70	100
	20IT4501B	Distributed Systems	3	0	0	3	30	70	100
	20IT4501C	Software Requirements Management	3	0	0	3	30	70	100
	20IT4501D	Neural Networks	3	0	0	3	30	70	100
	20IT4501E	Data Mining	3	0	0	3	30	70	100
6	20IT3551	Operating Systems Lab	0	0	3	1.5	15	35	50
7	20IT3552	Web Technologies Lab	0	0	3	1.5	15	35	50
8	20SS8551	Soft Skills	1	0	2	2	--	50	50
9	20MC1501	Constitution of India	2	0	0	0	30	70	100
10	20IT3581A	Summer Internship 4-6 weeks (Mandatory) after second year (to be evaluated during this 5th semester)	0	0	0	1.5	--	50	50
Total			**18**	**0**	**8**	**21.5**	**210**	**590**	**800**
12	Minor-20IT5501	Computer Networks	4	0	0	4	30	70	100
13	20IT6501	Social Media Analytics	4	0	0	4	30	70	100
	20IT6501	Security Governance Risk Management	4	0	0	4	30	70	100
	20IT6501	Scala programming	4	0	0	4	30	70	100
	20IT6501	Software Design and System Integration	4	0	0	4	30	70	100

III B.Tech II Semester

Sl. No	Course Code	Course Title	Hours Per week			Credits	CIE	SEE	Total marks
			L	T	P	C			
1	20IT3601	Machine Learning Techniques	3	0	0	3	30	70	100
2	20IT3602	Modern Web Applications	3	0	0	3	30	70	100
3	20ES1602	Internet of Things	3	0	0	3	30	70	100
		Professional Elective - II							
4	20IT4601A	Cyber Forensics	3	0	0	3	30	70	100
	20IT4601B	Cloud Computing	3	0	0	3	30	70	100
	20IT4601C	Object Oriented Software Engineering	3	0	0	3	30	70	100
	20IT4601D	Artificial Intelligence and Expert Systems	3	0	0	3	30	70	100
	20IT4601E	Data Visualization	3	0	0	3	30	70	100
		Open Elective - II							
5	20IT2601A	offered by IT to other Branches 1. Introduction to Data Mining	3	0	0	3	30	70	100
	20CE2601A	offered by other branches Ecology and Environment	3	0	0	3	30	70	100
	20EC2601A	MAT Lab Programming	3	0	0	3	30	70	100
	20EC2601B	TV Engineering	3	0	0	3	30	70	100
	20EE2601A	Energy Management	3	0	0	3	30	70	100
	20ME2601A	Value Engineering	3	0	0	3	30	70	100
	20ME2601B	Human Factors in Engineering	3	0	0	3	30	70	100
	20CS2601A	Introduction to Data Structures (not for IT students)	3	0	0	3	30	70	100
6	20IT3651	Machine Learning Lab	0	0	3	1.5	15	35	50
7	20IT3652	Full Stack Technologies Lab	0	0	3	1.5	15	35	50
8	20ES1652	Internet of Things Lab	0	0	3	1.5	15	35	50
9	20SA8652	Mobile Application Development	1	0	2	2	--	50	50
Total			**16**	**0**	**11**	**21.5**	**195**	**505**	**700**
Industrial/Research Internship(Mandatory) 4-6 weeks during Summer vacation									
11	20IT5601(Minor)	Software Engineering	4	0	0	4	30	70	100
12	20IT6601	Software Architecture and Design Patterns	4	0	0	4	30	70	100
	20IT6601	Advanced JAVA and J2EE	4	0	0	4	30	70	100
	20IT6601	Storage Area Networks	4	0	0	4	30	70	100
	20IT6601	High Performance Computing	4	0	0	4	30	70	100
13	Honors MOOCs/ NPTEL	User Centric Computing for HCI				2			
		MangoDB				2			

IV B.Tech I Semester

Sl. No	Course Code	Course Title	Hours Per week			Credits	CIE	SEE	Total marks
			L	T	P	C			
		Professional Elective - III							
1	20IT4701A	1. Wireless Sensor Networks	3	0	0	3	30	70	100
	20IT4701B	2. Recommender Systems	3	0	0	3	30	70	100
	20IT4701C	3. Elements of Software Project Management	3	0	0	3	30	70	100
	20IT4701D	4. Deep Learning	3	0	0	3	30	70	100
	20IT4701E	5. Mining Massive Datasets	3	0	0	3	30	70	100
		Professional Elective - IV							
2	20IT4702A	1. Adhoc Networks	3	0	0	3	30	70	100
	20IT4702B	2. Service Oriented Architecture	3	0	0	3	30	70	100
	20IT4702C	3. Agile Software Development	3	0	0	3	30	70	100
	20IT4702D	4. Natural Language Processing	3	0	0	3	30	70	100
	20IT4702E	5. Big Data Analytics	3	0	0	3	30	70	100
		Professional Elective - V							
3	20IT4703A	1. Fundamentals of Block Chain Technology	3	0	0	3	30	70	100
	20IT4703B	2. Cloud Security and Privacy	3	0	0	3	30	70	100
	20IT4703C	3. Software Testing Methodologies	3	0	0	3	30	70	100
	20IT4703D	4. Soft Computing	3	0	0	3	30	70	100
	20IT4703E	5. Data Science	3	0	0	3	30	70	100
		Open Elective - III							
4	20IT2701A	offered by IT to other Branches 1. Fundamentals of Data Science	3	0	0	3	30	70	100
	20CE2701A	offered by other branches Disaster Management and Preparedness	3	0	0	3	30	70	100
	20EC2701A	Embedded and Real time Systems	3	0	0	3	30	70	100
	20EC2701B	E-waste Management	3	0	0	3	30	70	100
	20EE2701A	Non-Conventional Energy Resources	3	0	0	3	30	70	100
	20ME2701A	Operation Research	3	0	0	3	30	70	100
	20ME2701B	Management Information Systems	3	0	0	3	30	70	100
	20CS2701A	Java Programming (not for IT students)	3	0	0	3	30	70	100

		Open Elective - IV							
5	20IT2702A	offered by IT to other Branches Fundamentals of Artificial Intelligence	3	0	0	3	30	70	100
	20CE2702A	offered by other branches Environmental Management and Audit	3	0	0	3	30	70	100
	20EC2702A	Telecommunications	3	0	0	3	30	70	100
	20EC2702B	Satellite Communications	3	0	0	3	30	70	100
	20EE2702A	Utilization of Electrical Power	3	0	0	3	30	70	100
	20ME2702A	Mechatronics	3	0	0	3	30	70	100
	20ME2702B	Robotics	3	0	0	3	30	70	100
	20CS2702A	Database Management Systems (not for IT students)	3	0	0	3	30	70	100
		Humanities and Social Sciences Elective							
6	20HS7701A	Managerial Economics and Financial Analysis	3	0	0	3	30	70	100
	20HS7701B	Human Resources Management	3	0	0	3	30	70	100
	20HS7701C	Entrepreneurship Management	3	0	0	3	30	70	100
	20HS7701D	Organizational Behavior	3	0	0	3	30	70	100
	20HS7701E	Construction Management	3	0	0	3	30	70	100
	20HS7701F	Industrial Engineering Management	3	0	0	3	30	70	100
	20HS7701G	Project Management	3	0	0	3	30	70	100
7	20SA8756	Sales force Technologies	1	0	2	2	--	50	50
8	20IT3781B/C	Industrial/Research Internship 4-6 weeks (Mandatory) after third year (to be evaluated during this 7th semester)	0	0	0	3	--	50	50
Total			**19**	**0**	**2**	**23**	**180**	**520**	**700**
9	20IT5701	Cloud Computing	4	0	0	4	30	70	100
10	Minor MOOC	Data Structures				2			
		DBMS				2			
11	20IT6701	Applications of Deep Learning	4	0	0	4	30	70	100
	20IT6701	Information Retrieval Systems	4	0	0	4	30	70	100
	20IT6701	Perception and Computer Vision	4	0	0	4	30	70	100
	20IT6701	Multi Agent Systems	4	0	0	4	30	70	100
12	Honors MOOC/NPTEL	Scalable Data Science				2			
		Multicore Computer Architecture storage and Interconnects.				2			

IV B.Tech II Semester

Sl. No	Course Code	Course Title	Hours Per week			Credits	CIE	SEE	Total marks
			L	**T**	**P**	**C**			
1	20IT3861	Project Work	0	0	0	8	60	140	200
Total			**0**	**0**	**0**	**8**	**60**	**140**	**200**

Communicative English I

Course Code	20HS1101	**Year**	I	**Semester**	I
Course Category	Humanities	**Branch**	IT	**Course Type**	Theory
Credits	3	**L-T-P**	3-0-0	**Prerequisites**	Nil
Continuous Internal Evaluation	30	**Semester End Evaluation**	70	**Total Marks**	100

Course Outcomes

Upon successful completion of the course, the student will be able to

CO1	Understand the concept of LSRW and basic grammar (L2)
CO2	Apply grammar to various situations (L3)
CO3	Practice different styles of Reading and Comprehending (L3)
CO4	Illustrate the text to process the information for various purposes. (L4)
CO5	Reframe the text for effective communication. (L4)

Contribution of Course Outcomes towards achievement of Program Outcomes &Strength of correlations (3:High, 2: Medium, 1:Low)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1														1
CO2										3		3		1
CO3									3	3		3		1
CO4										3		3		1
CO5									3	3		3		1

Syllabus

Unit No.	Syllabus	Mapped CO's
1	**Reading:** Skimming to get the main idea of a text; Scanning to look for specific pieces of information. **Reading for Writing:** Beginnings and endings of paragraphs - Introducing the topic, summarizing the main idea and/or providing a transition to the next paragraph. **Grammar and Vocabulary:** Content words and function words; Word forms: Verbs, Nouns, Adjectives and Adverbs; Nouns: countable and uncountable; singular and plural; Basic sentence structures; Simple Question form - wh-questions; Word order in sentences.	CO1,CO3, CO5
2	**Reading:** Identifying sequence of ideas; recognizing verbal techniques that help to link the ideas in a paragraph together. **Writing:** Paragraph writing (specific topics) using suitable cohesive devices; Mechanics of writing - punctuation, capital letters. **Grammar and Vocabulary:** Cohesive devices - linkers, sign posts and transition signals; Use of articles and zero article; prepositions One word substitutes	CO1,C02, CO5
3	**Reading:** Reading a text in detail by making basic inferences - recognizing and interpreting specific context clues; strategies to use text clues for comprehension. **Writing:** Summarizing - identifying main idea/s and rephrasing what is read; avoiding redundancies and repetitions. **Grammar and Vocabulary:** Verbs - Tenses; Subject-verb agreement; DirectAnd Indirect speech, Reporting verbs for academic purposes. Idiomatic expressions	CO1,CO3, CO4,CO5

4	**Reading:** Studying the use of graphic elements in texts to convey information, reveal trends/patterns/relationships, communicate processes or display complicated data. **Writing:** Information transfer; describe, compare, contrast, identify significance/trends based on information provided in figures/charts/graphs/tables. **Grammar and Vocabulary:** Quantifying expressions - adjectives and adverbs; comparing and contrasting; Degrees of comparison; Use of antonyms **Correction of sentences**	CO1,CO2, CO4,CO5
5	**Reading:** Reading for comprehension. **Writing:** Writing structured essays on specific topics using suitable claims and evidences **Grammar and Vocabulary:** Editing short texts – Identifying and correcting common errors in grammar and usage (Articles, Prepositions, Tenses, Subject-verb agreement) **Prefixes/suffixes**	CO1,CO3, CO5

Learning Resources

Text Books

1. Prabhavathy Y, M.Lalitha Sridevi, Ruth Z. Hauzel, "English all Round 1: Communication skills for Undergraduate students", Orient Black Swan, 2019

Reference Books

1. Bailey, Stephen. Academic writing: A handbook for international students. Routledge, 2014.
2. Skillful Level 2 Reading & Writing Student's Book Pack (B1) Macmillan Educational.
3. Hewings, Martin. Cambridge Academic English (B2). CUP, 2012

e- Resources & other digital material

Grammar/Listening/Writing:
1-language.com; http://www.5minuteenglish.com/
https://www.englishpractice.com/

Grammar/Vocabulary:
English Language Learning Online; http://www.bbc.co.uk/learningenglish/
http://www.better-english.com/; http://www.nonstopenglish.com/
https://www.vocabulary.com/; BBC Vocabulary Games
Free Rice Vocabulary Game

Reading:
https://www.usingenglish.com/comprehension/; https://www.englishclub.com/reading/short-stories.htm; https://www.english-online.at/

All Skills:
https://www.englishclub.com/; http://www.world-english.org/
http://learnenglish.britishcouncil.org/

Online Dictionaries:
Cambridge dictionary online; MacMillan dictionary; Oxford learner's dictionaries

Calculus and Linear Algebra

CourseCode	20BS1101	**Year**	I	**Semester**	I
Course Category	Basic Science	**Branch**	IT	**Course Type**	Theory
Credits	3	**L-T-P**	3-0-0	**Prerequisites**	Nil
Continuous Internal Evaluation	30	**Semester End Evaluation**	70	**Total Marks**	100

Course Outcomes

Upon successful completion of the course, the student will be able to

CO1	**Understand** the basic concepts of calculus and linear algebra.(L2)
CO2	**Apply** the echelon form to obtain the solution of system of linear equations and eigen vectors of a matrix.(L3)
CO3	**Apply** the concepts of calculus to find the series expansion and extremum of a given function, area enclosed by plane curves and volume of the solids. (L3)
CO4	**Analyse** the solution set of linear system of equations and nature of the quadratic forms. (L4)
CO5	**Analyse** the behaviour of functions using mean value theorems, extremum of the given function and limits of integration. (L4)
CO6	**Apply** the concepts of calculus and linear algebra to the given problem and **submit a report(L3)**

Contribution of Course Outcomes towards achievement of Program Outcomes &Strength of correlations (3:High, 2: Medium, 1:Low)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1													1	
CO2	3								2	2			1	
CO3	3								2	2			1	
CO4		3											1	
CO5		3											1	
CO6	3								2	2			1	

Syllabus

Unit No.	Syllabus	Mapped CO's
1	**Matrices-Linear System of Equations:** Rank of a matrix by Echelon form, Normal form, PAQ form, solving system of homogeneous and non-homogeneous linear equations.	CO1,CO2, CO4,CO6
2	**Eigen values and Eigen Vectors:** Eigen values, Eigen vectors and their properties, Cayley-Hamilton theorem (without proof), finding inverse and power of a matrix by Cayley-Hamilton theorem, diagonalization of a matrix, quadratic forms and nature of the quadratic forms.	CO1,CO2, CO4,CO6
3	**Mean Value Theorems:** Rolle‘s Theorem, Lagrange‘s mean value theorem, Cauchy‘s mean value theorem, Taylor‘s and Maclaurin‘s theorems with remainders (without proofs).	CO1,CO3, CO5,CO6
4	**Multivariable Calculus:** Functions of several variables, Jacobian, Functional dependence, maxima and minima of functions of two variables, method of Lagrange's multipliers.	CO1,CO3, CO5,CO6

5	**Multiple Integrals:** Double integrals, change of order of integration, double integration in polar coordinates, Triple integrals, change of variables between Cartesian, cylindrical and spherical polar co-ordinates, volume as triple integral. **Application-** Areas enclosed by plane curves.	CO1,CO3, CO5,CO6

Learning Resources

Text Books

1. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 44/e, 2019.
2. Erwin Kreyszig, Advanced Engineering Mathematics, 9/e, John Wiley & Sons, 2006

Reference Books

1. N.P. Bali and Manish Goyal, A Text book of Engineering Mathematics, Laxmi Publications, 2008.

e- Resources & other digital material

1. https://nptel.ac.in/courses/111/108/111108157/
2. https://www.nptel.ac.in/courses/111/104/111104125/
3. https://youtu.be/xDSejIvZmg4
4. http://202.53.81.118/ -> PVPSIT FED-Moodle

Engineering Physics

Course Code	20BS1103	**Year**	I	**Semester**	I
Course Category	Basic Science	**Branch**	IT	**Course Type**	Theory
Credits	3	**L-T-P**	3-0-0	**Prerequisites**	Nil
Continuous Internal Evaluation	30	**Semester End Evaluation**	70	**Total Marks**	100

Course Outcomes

Upon successful completion of the course, the student will be able to

CO1	**Understand** the electric, magnetic, optical communication and semiconductor principles in technical aspects. **(L2)**
CO2	**Apply** the knowledge of Physics and optical Principles in optoelectronic devices. **(L3)**
CO3	**Apply** basic laws of electromagnetism and materials for engineering applications**. (L3)**
CO4	**Analyze** the theory of solids and deduce different analytical parameters. **(L4)**
CO5	**Examine** the mechanism of electromagnetic, in sensors and semiconductor devices. **(L4)**
CO6	**Ability** to understand the concepts of optical fibers, the theory of solids, laws of electromagnetism, principles of semiconductor devices and submit a report.(L2)

Contribution of Course Outcomes towards achievement of Program Outcomes &Strength of correlations (3:High, 2: Medium, 1:Low)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1														
CO2	3													
CO3	3													
CO4		3												
CO5		3												
CO6									2	2		2		

Syllabus

Unit No.	Syllabus	Mapped CO's
1	**Fiber Optics:** Introduction, advantages of optical fibers, principle and structure, acceptance angle, numerical aperture, modes of propagation, classification of fibers, fiber optic communication, fiber optic sensors (Temperature, displacement and force), applications.	CO1,CO2 CO5, CO6
2	**Dielectric and Magnetic materials** **Dielectric-materials:** Introduction, electronic polarization, dielectric polarizability, susceptibility and dielectric constant, types of polarizations (Qualitative), frequency dependence of polarization, Lorentz field (quantitative), Clausius - Mossotti equation. **Magnetic materials:** Introduction, magnetic dipole moment, magnetization, magnetic susceptibility and permeability, origin of permanent magnetic moment, classification of magnetic materials, domain theory, hysteresis, soft and hard magnetic materials.	CO1,CO3 CO4, CO6

3	**Electromagnetics:** **Electrostatic field:** Electric potential, Coulombs law and Gauss law, derivation of Coulombs law from Gauss law, applications of Gauss law (line charge, thin sheet of charge and solid charged sphere), Gauss law of electrostatics in dielectric medium, Poisson's and Laplace equations.	CO1,CO3 CO5, CO6
	Magnetostatic field: Bio–Savart law, Faraday's and Ampere's laws in integral and differential form, displacement current, continuity equation and Maxwell's equations (qualitatively).	
4	**Semiconductor Physics** Introduction, origin of energy band, intrinsic and extrinsic semiconductors, generation and recombination, carrier concentration in intrinsic semiconductors, variation of Fermi level with temperature in intrinsic semiconductor, n-type and p-type semiconductors, carrier concentration in n type and p type semiconductors, variation of Fermi level with temperature in extrinsic semiconductors.	CO1,CO3, CO4, CO6
5	**Semiconductor Devices** Drift and diffusion currents in semiconductors, Hall effect and its applications, p-n junction diode formation and V-I characteristics, direct and indirect band gap semiconductors, construction and working of photodiode, LED, solar cell	CO1, CO2, CO5, CO6

Learning Resources

Text Books

1. R. K. Gaur, S. L. Gupta, "Engineering Physics", Dhanpat Rai Publications, 8th Edition, 2001.
2. S. O. Pillai, Solid State Physics, New age international publishers, 7th edition (2016)

Reference Books

1. A Text Book of Engineering Physics, M.N.Avadhanulu & P.G.Kshrisagar, S.Chand Publications, fourth edition, 2014.
2. Semiconductor Devices & Physics, S.M.Sze,Wiley, 2008.
3. Applied Physics, P.K. Palanai Swamy, Sci-Tech Publications. December, 2018
4. Engineering Physics, Dr.M.Arumugam, Anuradha Publications, Second edition, 2005.
5. Introduction To Electrodynamics, David.J.Griffths, Pearson Education India Learning Private Limited, Fourth edition, 2015.

e- Resources & other digital material

1. http://physicsforidiots.com/physics/electromagnetism/
2. https://www.arcelect.com/fibercable.htm
3. http://freevideolectures.com/Course/3048/Physics-of-Materials/36
4. https://www.iitk.ac.in/mse/electronic-materials-and-devices
5. https://link.springer.com/chapter/10.1007/978-3-319-48933-9_35

Basic Electrical and Electronics Engineering

Course Code	20ES1101	**Year**	I	**Semester**	I
Course Category	Engineering Science	**Branch**	IT	**Course Type**	Theory
Credits	3	**L-T-P**	3-0-0	**Prerequisites**	Nil
Continuous Internal Evaluation	30	**Semester End Evaluation**	70	**Total Marks**	100

Course Outcomes

Upon successful completion of the course, the student will be able to

CO1	**Understand** the basic concepts of DC circuits, Electrical Machines, Concepts of Electronic Devices and Circuits and realize the Applications of Electrical & Electronics in Interdisciplinary Engineering Domains (L2)
CO2	**Apply** the basic knowledge of mathematics, science and electrical engineering to obtain the desired parameters of Electric circuits and Machines. (L3)
CO3	**Analyse** the behaviour of Electric circuits, transformers and Electrical machines. (L4)
CO4	**Apply** the basic principles of Electronics to solve Analog Circuits. (L3)
CO5	**Analyse** the characteristics/ performance parameters of Electronic Circuits. (L4)
CO6	**Ability** to investigate various problems in DC circuits, Electrical Machines and Electronic Devices and Circuits and submit a report.(L2)

Contribution of Course Outcomes towards achievement of Program Outcomes &Strength of correlations (3:High, 2: Medium, 1:Low)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1														
CO2	3													
CO3		3												
CO4	3												1	
CO5		3											1	
CO6				3					2	2				

Syllabus

Unit No.	Syllabus	Mapped CO's
1	**Basic laws and Theorems-DC Circuits**: Ohms law, Kirchhoff's Laws, series and parallel resistive circuits, source transformations, delta-wye conversion. Mesh analysis, nodal analysis. Superposition theorem, Thevenin's theorem, Norton's theorem and maximum power transfer theorem with simple examples (**independent sources only**).	CO1,CO2, CO3,CO6
2	**DC Machines**: Construction, working principle, Voltage Build up, EMF equation, Torque expression, types of excitation, types of dc machines, necessity of Starter, losses and efficiency.	CO1,CO2, CO3,CO6
3	**Transformers**: Construction, working principle, EMF equation, open and short-circuit tests, voltage regulation definition, losses and efficiency. **Three Phase Induction Motors:** Construction, working principle of three phase induction motor.	CO1,CO2, CO3,CO6
4	**Semiconductor Devices**: P-N Junction diode - Basic operating principle, current-voltage characteristics, half-wave rectifier, full-wave rectifier, rectifiers with filter capacitor, Zener diode as Voltage Regulator.	CO1,CO4, CO5,CO6
5	**Operational Amplifiers**: The Ideal Op Amp, The Inverting Configuration-The closed loop gain, Effect of Finite open-loop gain, The Non-inverting Configuration - The closed loop gain, Characteristics of Non Inverting Configuration, Effect of finite open loop gain, The voltage follower.	CO1,CO4, CO5,CO6

Learning Resources

Text Books

1. D.P.Kothari, I.J.Nagrath, Basic Electrical and Electronics Engineering, 1st Edition, McGraw HillEducation (India) Private Limited, 2017.
2. B.L.Theraja, Fundamentals of Electrical Engineering and Electronics, 1st Edition, S.ChandPublishing, New Delhi, 2006.
3. Millman Jacob, Halkias C Christos, Electronic Devices and Circuits, 2nd Edition, Tata Mcgrawhill Publications, 2007.

Reference Books

1. S.K. Bhattacharya, Basic Electrical and Electronics Engineering, Pearson Education, 2011.
2. Dharma Raj Cheruku, B T Krishna, Electronic Devices and Circuits, 2nd Edition, Pearson Education, 2008.
3. R.K.Rajput, Basic Electrical and Electronics Engineering, University Science Press, New Delhi,2012.

e- Resources & other digital material

1. http://202.53.81.118/course/view.php?id=122
2. https://nptel.ac.in/courses/108105112/

Problem Solving Techniques

Course Code	20ES1103	**Year**	I	**Semester**	I
Course Category	Engineering Science	**Branch**	IT	**Course Type**	Theory
Credits	3	**L-T-P**	3-0-0	**Prerequisites**	Nil
Continuous Internal Evaluation	30	**Semester End Evaluation**	70	**Total Marks**	100

Course Outcomes

Upon successful completion of the course, the student will be able to

CO1	Understand the fundamental concepts of computers, algorithms, flowcharts and problem solving techniques. (L2)
CO2	Apply the basic knowledge of mathematical factoring methods to model an algorithm, flowchart for a given problem. (L3)
CO3	Apply the concept of arrays for implementing merging, sorting, searching, text processing and pattern matching techniques to develop algorithms.(L3)
CO4	Analyze the given problem to develop an efficient solution using sorting or pattern searching techniques.(L4)

Contribution of Course Outcomes towards achievement of Program Outcomes &Strength of correlations (3:High, 2: Medium, 1:Low)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3												1	1
CO2	3												2	2
CO3	3												2	2
CO4		3							3	3			2	2

Syllabus

Unit No.	Syllabus	Mapped CO's
1	**Introduction:** Components of a Computer System, Introduction to Algorithms and Flowcharts. Fundamental Algorithms: Exchanging the values of two variables, Counting, Summation of a set of numbers, Factorial Computation, Generation of Fibonacci sequence, Reversing the digits of an integer.	CO1, CO2
2	**Factoring Methods:** Finding the square root of a number, smallest divisor of an integer, Greatest common divisor of two integers, Generating prime numbers, Computing Prime Factors of an integer, generation of pseudo random numbers, raising a number to a large power, computing nth Fibonacci number	CO1, CO2
3	**Array Techniques:** Array order reversal, Array counting or Histogramming, finding the maximum number in a set, removal of duplicates from an ordered array, partitioning an array, finding the kth smallest element	CO1, CO3
4	**Merging, Sorting and Searching:** The two-way merge, sorting by selection, sorting by exchange, sorting by Insertion, Linear search, binary search.	CO1, CO3, CO4
5	**Text Processing and Pattern Searching:** Keyword searching in text, Text line editing, Linear pattern search, Sublinear pattern search.	CO1, CO3, CO4

Learning Resources

Text Books

1. How to Solve it by Computer, R.G. Dromey, First Edition, 2006, Pearson

Reference Books

1. Fundamentals of Computers, Reema Thareja, Oxford University Press.
2. Flowchart and Algorithm Basics: The Art of Programming, A B Chaudhuri, 2020, Mercury Learning and Information.
3. Algorithms Unlocked, Thomas H. Coremen, 2013, The MIT Press.
4. An Introduction to Programming and Problem Solving with Pascal, Michael Schneider, Steven W. Weingart, David M. Perlman, Second Edition, 2011, Wiley India

e- Resources & other digital material

1. https://onlinecourses.swayam2.ac.in/nou20_cs03/preview
2. https://www.coursera.org/learn/problem-solving?#about
3. https://www.udemy.com/course/flowchartingcourse/
4. https://raptor.martincarlisle.com/

Communicative English I Lab

Course Code	20HS1151	Year	I	Semester	I
Course Category	Humanities	Branch	IT	Course Type	Lab
Credits	1.5	L-T-P	0-0-3	Prerequisites	Nil
Continuous Internal Evaluation	15	Semester End Evaluation	35	Total Marks	50

Course Outcomes

Upon successful completion of the course, the student will be able to

CO1	Acquire communication skills through various language learning activities (L3)
CO2	Construct meaningful sentences and Paragraphs(L3)
CO3	Analyze the text to develop comprehensive ability (L4)
CO4	Preparation of report based on the activity (L4)

Contribution of Course Outcomes towards achievement of Program Outcomes &Strength of correlations (3:High, 2: Medium, 1:Low)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO 2
CO1									3	3		3		1
CO2										3				1
CO3										3		3		1
CO4									3	3				1

Syllabus

Expt. No.	Experiments	Mapped CO's
1	Identifying the topic, the context and specific pieces of information by listening to short audio texts and answering a series of questions.	CO1,CO4
2	Asking and answering general questions on familiar topics such as home, family, work, studies and interests; introducing oneself and others.	
3	Answering a series of questions about main idea and supporting ideas after listening to audio texts.	CO1,CO2, CO4
4	Discussion in pairs/ small groups on specific topics followed by short structured talks.	
5	Listening for global comprehension and summarizing what is listened to.	CO1,CO3, C04
6	Discussing specific topics in pairs or small groups and reporting what is discussed	
7	Making predictions while listening to conversations/transactional dialogues without video; listening with video	CO1,CO4
8	Role plays for practice of conversational English in academic contexts (formal and informal) - asking for and giving information/directions.	
9	Identifying key terms, understanding concepts and answering a series of relevant questions that test comprehension.	CO1,CO4
10	Formal oral presentations on topics from academic contexts -without the use of PPT slides.	

Learning Resources
Text Books
1. Prabhavathy Y, M.Lalitha Sridevi, Ruth Z. Hauzel, "English all Round 1: Communication skills for Undergraduate students", Orient Black Swan, 2019
Reference Books
1. Chase, Becky Tarver. Pathways: Listening, Speaking and Critical Thinking. Heinley ELT; 2ndEdition, 2018. 2. Skillful Level 2 Reading & Writing Student's Book Pack (B1) Macmillan Educational. 3. Hewings, Martin. Cambridge Academic English (B2). CUP, 2012
e- Resources & other digital material
Grammar/Listening/Writing: 1-language.com http://www.5minuteenglish.com/ https://www.englishpractice.com/ **Listening:** https://learningenglish.voanews.com/z/361 3; http://www.englishmedialab.com/listening.html **Speaking:** https://www.talkenglish.com/BBC; Learning English – Pronunciation tips Merriam-Webster – Perfect pronunciation Exercises All Skills: https://www.englishclub.com/; http://www.world-english.org/ http://learnenglish.britishcouncil.org/ **Online Dictionaries:** Cambridge dictionary online; MacMillan dictionary; Oxford learner's dictionaries

Engineering Physics Lab

Course Code	20BS1152	**Year**	I	**Semester**	I
Course Category	Basic Science	**Branch**	IT	**Course Type**	Lab
Credits	1.5	**L-T-P**	0-0-3	**Prerequisites**	Nil
Continuous Internal Evaluation	15	**Semester End Evaluation**	35	**Total Marks**	50

Course Outcomes

Upon successful completion of the course, the student will be able to

CO1	Demonstrate the importance of dielectric material and measure magnetic parameters. [L3]
CO2	Identify the type of semiconductor using hall effect and measure the energy band gap. [L3]
CO3	Examine the characteristics of photodiode, p-n junction diode and solar cell. [L4]
CO4	Assess the intensity of the magnetic field of circular coil carrying current with distance and measure resistance using four probe method. [L4]
CO5	Estimate the acceptance angle of an optical fiber and numerical aperture. [L4]
CO6	Summarize and tabulate the experimental observations and output.

Contribution of Course Outcomes towards achievement of Program Outcomes & Strength of correlations (3:High, 2: Medium, 1:Low)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO 2
CO1	3			3								2		
CO2	3			3								2		
CO3	3			3								2		
CO4	3			3								2		
CO5	3			3								2		
CO6	3			3								2		

Syllabus

Expt. No.	Experiments	Mapped CO's
1	Determine the Dielectric Constant of various Solid samples.	CO1,CO6
2	Determine the Magnetic Susceptibility by Gouy's Method.	
3	Determine the Hall Coefficient using Hall Effect experiment.	CO2,CO6
4	Determine the Energy Band gap of a Semiconductor.	
5	Study the characteristic curves of a Photo Diode.	CO3,CO6
6	Illustrate the V-I the characteristics of P-N junction Diode.	
7	Draw the V-I characteristics of a Solar Cell.	
8	Determine The Magnetic Field along the axis of a Circular Coil carrying current.	CO4,CO6
9	Determine the Resistivity of Semiconductor by Four Probe Method.	
10	Determine the Numerical Aperture of a given Optical Fibre and Find its cceptance Angle.	CO5,CO6

Learning Resources
Text Books
1. RamaraoSri, Choudary Nityanand and Prasad Daruka, "Lab Manual of Engineering Physics"Vth ed., Excell Books, 2010
Reference Books
1. Semiconductor Devices & Physics, S.M.Sze, Wiley, 2008.
e- Resources & other digital material
1. https://nptel.ac.in/courses/115/105/115105120/ 2. https://nptel.ac.in/courses/115/107/115107095/ 3. https://nptel.ac.in/courses/115/104/115104109/ 4. http://www.physicsclassroom.com/The-Laboratory 5. https://www.vlab.co.in/broad-area-physical-sciences 6. https://www.niser.ac.in/sps/teaching-laboratories

Basic Electrical and Electronics Engineering Lab

Course Code	20ES1151	**Year**	I	**Semester**	I
Course Category	Engineering Science	**Branch**	IT	**Course Type**	Lab
Credits	1.5	**L-T-P**	0-0-3	**Prerequisites**	Nil
Continuous Internal Evaluation	15	**Semester End Evaluation**	35	**Total Marks**	50

Course Outcomes

Upon successful completion of the course, the student will be able to

CO1	Apply techniques/procedures of Electrical & Electronics Engineering to solve problems (L3).
CO2	Conduct experiments as a team / individual by using equipment available in the laboratory.(L2)
CO3	Examine the network theorems and Kirchhoff’s laws for DC electrical circuits (L4).
CO4	Analyse the open circuit characteristic of DC shunt generator and efficiency of single phase transformer (L4).
CO5	Analyse the characteristics/ performance parameters of Electronic and Analog Circuits. (L4)
CO6	Make an effective report based on experiments

Contribution of Course Outcomes towards achievement of Program Outcomes &Strength of correlations (3:High, 2: Medium, 1:Low)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3			3										
CO2				3	3				3				1	1
CO3		3		3										
CO4		3		3										
CO5		3		3										
CO6				3						3			1	1

Syllabus

Expt. No.	Syllabus	Mapped CO’s
	Conduct any ten experiments	
1	Verification of Kirchhoff‘s Laws KVL and KCL.	CO1,CO2, CO3,CO6
2	Verification of DC Superposition Theorem.	CO1,CO2, CO3,CO6
3	Verification of Thevenin's Theorem and Norton's Theorem.	CO1,CO2, CO3,CO6
4	Open circuit characteristics/magnetization characteristics of DC shunt generator.	CO1,CO2, CO4,CO6
5	OC and SC Tests on single phase transformer.	CO1,CO2, CO4,CO6
6	Voltage Current Characteristics of a p-n Junction Diode.	CO1,CO2, CO5,CO6
7	Half wave rectifier with and without filter.	CO1,CO2, CO5,CO6

8	Full wave rectifier with and without filter.	CO1,CO2, CO5,CO6
9	Voltage Regulation with Zener Diode.	CO1,CO2,
10	Inverting and Non-inverting Amplifier Design with Op-amp	CO5,CO6
11	Verification of KCL and KVL using PSPICE.	CO1,CO2,
12	Verification of Network Theorems using PSPICE	CO5,CO6
13	Diode and Transistor Circuit Analysis using PSPICE	CO1,CO2,
	Inverting and Non-inverting Amplifier Design with Op-ampusing PSPICE	CO3,CO6

Learning Resources

Text Books

1. D.P.Kothari, I.J.Nagrath, Basic Electrical and Electronics Engineering, 1st Edition, McGraw Hill Education (India) Private Limited, 2017.
2. B.L.Theraja, Fundamentals of Electrical Engineering and Electronics, 1st Edition, S.Chand Publishing, New Delhi, 2006.
3. Millman Jacob, Halkias C Christos, Electronic Devices and Circuits, 2nd Edition, Tata Mcgrawhill Publications, 2007.

Reference Books

1. S.K. Bhattacharya, Basic Electrical and Electronics Engineering, Pearson Education, 2011.
2. Dharma Raj Cheruku, B T Krishna, Electronic Devices and Circuits, 2nd Edition, Pearson Education, 2008.
3. R.K.Rajput, Basic Electrical and Electronics Engineering, University Science Press, New Delhi, 2012.

e- Resources & other digital material

1. http://202.53.81.118/course/view.php?id=122
2. https://nptel.ac.in/courses/108105112/

Communicative English II

Course Code	20HS1201	**Year**	I	**Semester**	II
Course Category	Humanities	**Branch**	IT	**Course Type**	Theory
Credits	3	**L-T-P**	3-0-0	**Prerequisites**	Nil
Continuous Internal Evaluation	30	**Semester End Evaluation**	70	**Total Marks**	100

Course Outcomes

Upon successful completion of the course, the student will be able to

CO1	Understand various Linguistic aspects (L2)
CO2	Apply language to draft letters for various business purposes(L3)
CO3	Interpret the text for information processing and effective communication. (L3)
CO4	Analyze the data for report writing and précis writing. (L4)
CO5	Relate advanced writing skills for better employability. (L4)

Contribution of Course Outcomes towards achievement of Program Outcomes & Strength of correlations (3:High, 2: Medium, 1:Low)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1														1
CO2									3	3		3		1
CO3									3	3		3		1
CO4									3	3		3		1
CO5									3	3		3		1

Syllabus

Unit No.	Syllabus	Mapped CO's
1	**Reading:** Reading for presenting - strategies to select, compile and synthesize information for presentation-Comprehending a wide range of texts -Reading to recognize academic style **Reading for Writing:** Paraphrasing - using quotations and in-text references; using academic style - avoiding colloquial words and phrases - Writing an essay after researching a topic - Citing the sources used **Grammar and Vocabulary:** Academic verbs in context; formal words and phrases-Awareness about Root words	CO1, CO3, CO5
2	**Reading:** Recognizing formal and informal styles -Recognizing the difference between facts and opinions - Identifying and understanding different perspectives **Writing:** Letter writing and e mail writing - Structure, Conventions and Etiquette – Informal, semi-formal and formal (enquiry, complaints, seeking permission, seeking internship - Re-draft a piece of text from a different perspective - Writing brief critical reviews of short texts. Communication skills-verbal /Non verbal **Grammar and Vocabulary:** Agreement: Subject-verb, Noun-pronoun; Editing short texts - Phrasal verbs - Phrasal prepositions - Avoiding clichés	CO1,CO2, CO4, CO5
3	**Reading:** Identifying claims, evidences, views/opinions, purpose, and stance/position -Understand the correlation between a talk and a reading text based on inferences made. **Writing:** Writing structured analytical and argumentative essays on general topics using suitable claims and evidences with the sources cited-Peer review of	CO1, CO3, CO5

	the essays written **Grammar and Vocabulary:** Language for different functions such as stating a point, expressing opinion, Agreeing/disagreeing, Adding information to what someone has stated, and asking for clarification - Modifiers and misplaced modifiers. Corporate grooming	
4	**Reading:** Reading varied text types - Structure and contents of a formal report - Sections in a report and understanding the purpose of each section- Significance of references **Writing:** Writing reports **Grammar and Vocabulary:** Active and passive voice - Use of passive verbs in academic writing- **Precise writing**	CO1, CO3 CO4, CO5
5	**Reading:** Reading for inferential comprehension **Writing:** Writing one's CV and cover letter - Applying for a job/internship **Grammar and Vocabulary:** Reinforcing learning **-** Edit one's writing to correct common errors in grammar and usage **-** Use appropriate vocabulary for speaking and writing – Various purposes, Jumbled sentences	CO1, CO2, CO5

Learning Resources

Text Books

1. Prabhavathy Y, M.Lalitha Sridevi "English all Round2: Communication skills for Undergraduate students", Orient Black Swan, 2020

Reference Books

1. Bailey, Stephen. Academic writing: A handbook for international students. Routledge, 2014.
2. Skillful Level 2 Reading & Writing Student's Book Pack (B1) Macmillan Educational.
3. Hewings, Martin. Cambridge Academic English (B2). CUP, 2012(Student Book, Teacher Resource Book, CD & DVD)

e- Resources & other digital material

Grammar/Listening/Writing:
1-language.com; http://www.5minuteenglish.com/ https://www.englishpractice.com/
Grammar/Vocabulary:
English Language Learning Online; http://www.bbc.co.uk/learningenglish/
http://www.better-english.com/; http://www.nonstopenglish.com/
https://www.vocabulary.com/; BBC Vocabulary Games
Free Rice Vocabulary Game
Reading:
https://www.usingenglish.com/comprehension/; https://www.englishclub.com/reading/short-stories.htm; https://www.english-online.at/
All Skills:
https://www.englishclub.com/; http://www.world-english.org/ http://learnenglish.britishcouncil.org/
Online Dictionaries:
Cambridge dictionary online; MacMillan dictionary; Oxford learner's dictionaries

Engineering Chemistry

Course Code	20BS1202	**Year**	I	**Semester**	II
Course Category	Basic Science	**Branch**	IT	**Course Type**	Theory
Credits	3	**L-T-P**	3-0-0	**Prerequisites**	Nil
Continuous Internal Evaluation	30	**Semester End Evaluation**	70	**Total Marks**	100

Course Outcomes

Upon successful completion of the course, the student will be able to

CO1	Understand the basic principles related to renewable energy sources, energy systems, metal finishing and materials (L2)
CO2	Apply the knowledge of energy transformation principles to classify and describe the working of electrodes and cells (L3)
CO3	Apply suitable methods for metal finishing and advanced techniques for the characterization of nano materials (L3)
CO4	Analyse the performance of different electrochemical techniques, energy conversion systems, polymers and nano materials in their respective applications (L4)
CO5	Make an effective report on various concepts and technologies related to Engineering chemistry.

Contribution of Course Outcomes towards achievement of Program Outcomes & Strength of correlations (3:High, 2: Medium, 1:Low)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1														
CO2	3						1					1	1	
CO3	3						1					1	1	
CO4	3						1					1	1	
CO5	3						1			2		1	1	

Syllabus

Unit No.	Syllabus	Mapped CO's
1	ELECTROCHEMICAL ENERGY SYSTEMS Introduction-Origin of electrode potential, Electrode Potentials, Measurement of Electrode Potentials, Nernst Equation for a single electrode, EMF of a cell, Types of Electrodes or Half Cells-Hydrogen and Calomel electrode, Electrochemical Cell, Galvanic Cell vs Electrolytic Cell, Electrochemical conventions, Types of Ion Selective Electrodes- glass membrane electrode, polymer membrane electrodes, solid state electrodes, gas sensing electrodes (classification only), Concentration Cells.	CO1, CO2, CO4, CO5
2	BATTERY TECHNOLOGY Basic concepts, battery characteristics, classification of batteries, Important applications of batteries, Classical batteries-dry/Leclanche cell, Modern batteries-zinc air, lithium cells-Li Mno2 cell- challenges of battery technology. Fuel cells- Introduction - classification of fuel cells – hydrogen and oxygen fuel cell, propane and oxygen fuel cell- Merits of fuel cell.	CO1, CO2, CO4, CO5
3	RENEWABLE SOURCES OF ENERGY Introduction- sources of renewable energy Solar energy – Introduction - Physical and Chemical properties of Silicon-	CO1, CO2,

	Production of Solar Grade Silicon from Quartz - Doping of Silicon- p and n type semi conductors- PV cell / solar cell- Manufacturing of Photovoltaic Cells using Chemical Vapor Deposition Technique-applications of solar energy	CO4,CO5
4	METAL FINISHING Technological importance of metal finishing, methods of metal finishing, manufacturing of electronic components, electrochemical techniques of forming, machining and etching, electrolytic cell, principle of electroplating, nature of electrodeposits, electroplating process, Electroplating of chromium, gold etc. Electroless plating of copper, nickel	CO1,CO3, CO4,CO5
5	POLYMERS & NANOMATERIALS Polymers: Introduction thermoplastic and thermo setting resins, Preparation, properties and uses of polystyrene and Polyphosphazines., differences between Nanomaterials: Introduction to nanomaterial: nanoparticles, nanocluster, carbon nanotube (CNT) and nanowires. Chemical synthesis of nanomaterials: sol-gel method. Characterization: Principle and applications of scanning electron microscope (SEM) and transmission electron microscope (TEM).	CO1,CO3 CO4,CO5

Learning Resources

Text Books

1. P.C. Jain and M. Jain, Engineering Chemistry, 15/e, DhanapatRai& Sons, Delhi (2014).
2. B.K. Sharma, Engineering Chemistry, Krishna Prakashan, Meerut.
3. O G Palanna, Engineering Chemistry, Tata McGraw Hill (2009).

Reference Books

1. Sashichawla, A Textbook of Engineering Chemistry, DhanapathRai and sons, (2003)
2. B.S Murthy and P. Shankar, A Text Book of NanoScience and NanoTechnology, UniversityPress (2013).
3. S.S. Dara, A Textbook of Engineering Chemistry, S.Chand& Co, (2010)
4. N.Krishna Murthy and Anuradha, A text book of Engineering Chemistry, M murthyPublications (2014).
5. K. SeshaMaheshwaramma and Mridula Chugh, Engineering Chemistry, Pearson India Edn services,(2016).

e- Resources & other digital material

1. https://nptel.ac.in/courses/105105178/
2. http://202.53.81.118/course/view.php?id=82

Probability and Statistics

Course Code	20BS1204	**Year**	I	**Semester**	II
Course Category	Basic Science	**Branch**	IT	**Course Type**	Theory
Credits	3	**L-T-P**	3-0-0	**Prerequisites**	Nil
Continuous Internal Evaluation	30	**Semester End Evaluation**	70	**Total Marks**	100

Course Outcomes

Upon successful completion of the course, the student will be able to

CO1	Understand the basic concepts of probability and statistics (L2).
CO2	Calculate the measures of central tendencies, correlation and regression to the given data and apply appropriate probability distributions to the given problem (L3).
CO3	Apply the concepts of testing hypothesis for large and small samples (L3).
CO4	Connect the concepts of probability, correlation and regression to real life problems (L4).
CO5	Identify appropriate test statistic to test given hypothesis for statistical decision (L4).
CO6	Apply the concepts of probability and statistics to the given data and submit the report.(L3)

Contribution of Course Outcomes towards achievement of Program Outcomes & Strength of correlations (3:High, 2: Medium, 1:Low)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1													1	
CO2	3								2	2			1	
CO3	3								2	2			1	
CO4		3											1	
CO5		3											1	
CO6	3								2	2			1	

Syllabus

Unit No.	Syllabus	Mapped CO's
1	**Measures of Central Tendency and Probability:** **Measures of central tendency** : Mean, Median, Mode **Probability**: Probability axioms, addition law and multiplicative law of probability, conditional probability, Baye's theorem (without proof).	CO1,CO2, CO4,CO6
2	**Random Variable and Probability Distributions:** Random variables (discrete and continuous), probability density functions, probability distribution - Binomial, Poisson and normal distribution-their properties (mathematical expectation and variance).	CO1,CO2, CO4,CO6
3	**Correlation, Regression:** Correlation, correlation coefficient, rank correlation, regression, lines of regression, regression coefficients, principle of least squares and curve fitting (straight Line, parabola and exponential curves).	CO1,CO2, CO4,CO6
4	**Testing of Hypothesis and Large Sample Tests:** Formulation of null hypothesis, alternative hypothesis, the critical region, two types of errors, level of significance. **Large Sample Tests**: Test for single proportion, difference of proportions, test for single mean and difference of means. Confidence interval for parameters in one sample and two sample problems	CO1,CO3, CO5,CO6
5	**Small Sample Tests:** Student t-distribution (test for single mean, two means and paired t-test), testing of equality of variances (F-test), $\chi 2$ - test for goodness of fit, $\chi 2$- test for independence of attributes.	CO1,CO3, CO5,CO6

Learning Resources
Text Books
1. S.C. Gupta and V.K. Kapoor, Fundamentals of Mathematical Statistics, 11/e, Sultan Chand & Sons Publications, 2012. 2. Dr.T.K.V. Iyengar, Dr.B.Krishna Gandhi, S. Ranganatham, Dr. M.V.S.S.N. Prasad, Probability & Statistics, Publications: S.Chand, 4th Revised Edition, 2012.
Reference Books
1. S. Ross, A First Course in Probability, Pearson Education India, 2002. 2. Miller and Freunds, Probability and Statistics for Engineers,7/e, Pearson, 2008
e- Resources & other digital material
1. https://nptel.ac.in/courses/111/106/111106150/ 2. https://nptel.ac.in/courses/111105035 3. http://202.53.81.118/ -> PVPSIT FED-Moodle

Programming for Problem Solving

Course Code	20ES1202	**Year**	I	**Semester**	II
Course Category	Engineering Science	**Branch**	IT	**Course Type**	Theory
Credits	3	**L-T-P**	3-0-0	**Prerequisites**	Problem Solving Techniques
Continuous Internal Evaluation	30	**Semester End Evaluation**	70	**Total Marks**	100

Course Outcomes

Upon successful completion of the course, the student will be able to

CO1	Understand the principles of structured programming and C constructs for solving problems. (L2)
CO2	Apply suitable control constructs and array concepts to solve problems. (L3)
CO3	Apply the concept of pointers, user defined data types and files to solve problems. (L3)
CO4	Analyze the given problem and use modular programming approach to develop solutions. (L4)

Contribution of Course Outcomes towards achievement of Program Outcomes & Strength of correlations (3:High, 2: Medium, 1:Low)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3												1	1
CO2	3												2	2
CO3	3												2	2
CO4		3							3	3			2	2

Syllabus

Unit No.	Syllabus	Mapped CO's
1	**Introduction to C:** Introduction, Structure of C Program, A Simple C Program, C-Tokens, Basic Data types, Variables, Constants, Input / Output statements, Operators, Type conversion and Type casting. **Conditional Branching Statements:** if, if-else, if-else-if Statements and Switch case.	CO1, CO2
2	**Iterative Statements:** while, do-while and for loops, Nested loops, break and continue statements. **Arrays:** Declaration, Accessing array elements, Storing values, Operations on arrays, Multi-dimensional arrays. **Strings:** Introduction, String manipulation functions.	CO1, CO2
3	**Functions:** Introduction, Function declaration, Function definition and Function call, Types of Functions, Parameter passing, Passing arrays to functions, Recursion, Storage classes, Command line arguments.	CO1, CO4
4	**Pointers:** Declaration and Initialization of pointer variables, Pointer arithmetic, Pointers and arrays, Pointer to pointer, Array of pointers, Pointers and functions, Dynamic memory allocation. **Pre-processor directives:** The #define Directive, Undefining a Macro, Token Pasting and Stringizing Operators, The #include Directive, Conditional Compilation.	CO1, CO3
5	**User defined data-types:** Introduction, bit-fields, Nested structures, Array of structures, Structures and functions, Unions, enum, typedef. **Files in C:** Using Files in C, Read data from files, Writing data to files, Random access to files of records.	CO1, CO3

Learning Resources
Text Books
1. Programming in C, ReemaThareja, AICTE Edition, 2018, Oxford University Press
Reference Books
1. Computer Science: A Structured Programming Approach Using C, B. A. Forouzan and R.F. Gilberg, Third Edition, 2007, Cengage Learning. 2. Programming in C, PradipDey, Manas Ghosh, AICTE Edition, Oxford University Press. 3. Programming with C, B. Gottfried, Third Edition, 2017, Schaum's outlines, McGraw Hill. 4. Problem Solving & Program Design in C,Jeri R. Hanly,Ellot B. Koffman,5th Edition, Pearson.
e- Resources & other digital material
1. http://cprogramminglanguage.net/ 2. https://www.geeksforgeeks.org/c-programming-language/ 3. https://www.greatlearning.in/academy/learn-for-free/courses/c-programming 4. https://www.udemy.com/course/the-complete-c-programming/ 5. https://nptel.ac.in/courses/106/105/106105171/

Engineering Graphics

Course Code	20ES1204	**Year**	I	**Semester**	II
Course Category	Engineering Science	**Branch**	IT	**Course Type**	Theory
Credits	3	**L-T-P**	1-0-4	**Prerequisites**	Nil
Continuous Internal Evaluation	30	**Semester End Evaluation**	70	**Total Marks**	100

Course Outcomes

Upon successful completion of the course, the student will be able to

CO1	Construct conic sections and curves used in Engineering practice. (L3)
CO2	Construct orthographic projections of an object when its position is defined with respect to the reference planes. (L3)
CO3	Develop the isometric view for the given orthographic projections and vice versa. (L3)
CO4	Develop the lateral surfaces of solids. (L3)
CO5	Identify the appropriate commands that are used to prepare the given drawing in CAD environment. (L3)

Contribution of Course Outcomes towards achievement of Program Outcomes & Strength of correlations (3:High, 2: Medium, 1:Low)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	2							2	2	2		1	
CO2	3	3							3	3	3		2	
CO3	2	2							2	2	2		2	
CO4	2	2							2	2	2		2	
CO5	2				2				2	2	2		3	

Syllabus

Unit No.	Syllabus	Mapped CO's
1	**Introduction to Engineering Graphics**: Principles of Engineering Graphics and their significance- Conventions in drawing, lettering, dimensioning, BIS conventions. a) **Conic sections**: Construction of ellipse, parabola and hyperbola (general method only) b) **Cycloidal curves**: Cycloid, Epicycloid and Hypocycloid c) **Involutes**: Involute of regular polygons and Circle.	CO1
2	**Projection of points, lines and planes:** Projection of points in different quadrants, lines inclined to one and both the reference planes, finding true length and inclination made by the line. Projections of regular plane surfaces.	CO2
3	**Projections of solids:** Projections of regular solids such as cube, prism, pyramid, cylinder and cone (Treatment limited to solids inclined to one of the reference planes). **Sections of solids**: Section planes and sectional view of right regular Solids- cube, prism, cylinder, pyramid and cone. True shape of the section. (Treatment limited to the solids perpendicular to one of the principal planes)	CO2
4	**Orthographic Views**: Systems of projections, conversion of Isometric view to orthographic view. **Isometric Projections**: Principles	CO3

	of Isometric projection- Isometric scale; **Isometric views**: lines, planes and solids. (Treatment is limited to simple objects only)	
5	**Development of surfaces:** Development of lateral surfaces of right regular solids-prism, cylinder, pyramid, cone and their sectional parts. (Treatment limited to solids perpendicular to one of the principal planes)	CO4
	Introduction to CAD: Basic drawing, editing and dimensioning commands: line, polyline, circle, arc, polygon, ellipse, rectangle, erase, undo, redo, snap, move, copy, rotate, scale, mirror, offset, layer, trim, extend, fillet, chamfer, array, linear and angular dimension.	CO5

Learning Resources

Text Books

1. N.D. Bhatt, Engineering Drawing, 53/e, Charotar Publishers, 2016.
2. K.L. Narayana&P.Kannaiah,EngineeringDrawing,3/e,ScitechPublishers,2012

Reference Books

1. Dhanajay A Jolhe, Engineering Drawing, Tata McGraw-Hill, 2009.
2. Shah and Rana, Engineering Drawing, 2/e, Pearson Education, 2009.
3. K.Venugopal, Engineering Drawing and Graphics, 6/e, NewAgePublishers,2011.
4. K.C. John, Engineering Graphics, 2/e, PHI,2013.
5. Basant Agarwal and C.M. Agarwal, Engineering Drawing, Tata McGrawHill, 2008.

e- Resources & other digital material

1. http://www.youtube.com/watch?v=XCWJ XrkWco, Accessed on 01-06-2017.
2. http://www.me.umn.edu/courses/me2011/handouts/drawing/blanco-tutorial.html#isodrawing, Accessed on 01-06-2017.
3. http://www.slideshare.net, Accessed on 01-06-2017.
4. http://edpstuff.blogspot.in, Accessed on 01-06-2017.

Communicative English II Lab

Course Code	20HS1251	**Year**	I	**Semester**	II
Course Category	Humanities	**Branch**	IT	**Course Type**	Lab
Credits	1.5	**L-T-P**	0-0-3	**Prerequisites**	Nil
Continuous Internal Evaluation	15	**Semester End Evaluation**	35	**Total Marks**	50

Course Outcomes

Upon successful completion of the course, the student will be able to

CO1	Hone employability skills (L3)
CO2	Develop an ability of making discussions, inferences and presentations (L3)
CO3	Refine communication skills through various strategies (L4)
CO4	Process the information in different contexts (L4)

Contribution of Course Outcomes towards achievement of Program Outcomes & Strength of correlations (3:High, 2: Medium, 1:Low)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1									3	3		3		1
CO2									3	3		3		1
CO3									3	3		3		1
CO4									3	3		3		1

Syllabus

Expt. No.	Syllabus	Mapped CO's
1	**Listening for presentation strategies and answering questions on the speaker, audience, and key points**	CO1, CO2, CO4
2	Formal presentations using PPT slides (individual)	
3	Relating a reading text to a talk/presentation – understanding different perspectives and drawing inferences	CO1, CO2, CO4
4	Formal team presentations using PPT slides/audio- visual aids	
5	Identifying views and opinions expressed by different speakers while listening to discussions	CO1, CO3, C04
6	Group discussion on general topics	
7	Processing of information using context clues while listening to talks/lectures	CO1, CO3, CO4
8	Role plays – people from various fields of work	
9	Processing of explicit information presented in the text and implicit information inferable from the text or from previous/background knowledge	CO1, CO3, CO4
10	Mock interviews for jobs/internships	

Learning Resources

Text Books

1. Prabhavathy Y, M.Lalitha Sridevi. "English all Round 2: Communication skills for Undergraduate Learners", Orient Black Swan, 2020

Reference Books

1. Chase, Becky Tarver. Pathways: Listening, Speaking and Critical Thinking. Heinley ELT; 2nd Edition, 2018.

2. Skillful Level 2 Reading & Writing Student's Book Pack (B1) Macmillan Educational. 3. Hewings, Martin. Cambridge Academic English (B2). CUP, 2012
e- Resources & other digital material
Grammar/Listening/Writing: 1-language.com http://www.5minuteenglish.com/ https://www.englishpractice.com/ **Listening:** https://learningenglish.voanews.com/z/3613; http://www.englishmedialab.com/listening.html **Speaking:** https://www.talkenglish.com/BBC; Learning English – Pronunciation tips Merriam-Webster – Perfect pronunciation Exercises **All Skills:** https://www.englishclub.com/; http://www.world-english.org/ http://learnenglish.britishcouncil.org/ **Online Dictionaries:** Cambridge dictionary online; MacMillan dictionary; Oxford learner's dictionaries

Engineering Chemistry Lab

Course Code	20BS1251	**Year**	I	**Semester**	II
Course Category	Basic Science	**Branch**	IT	**Course Type**	Lab
Credits	1.5	**L-T-P**	0-0-3	**Prerequisites**	Nil
Continuous Internal Evaluation	15	**Semester End Evaluation**	35	**Total Marks**	50

Course Outcomes

Upon successful completion of the course, the student will be able to

CO1	Demonstrate the working of instruments such as pH meter and Conduct meter.(L3)
CO2	Apply the acquired knowledge to determine the quantity of metal ions in a given solution(L3)
CO3	Estimate the amount of active chlorine in bleaching powder.(L4)
CO4	Compare the viscosities and surface tension of different liquids(L4)
CO5	Analyze different compounds and examine the preparation of different polymers (L4)
CO6	Make an effective report based on experiments

Contribution of Course Outcomes towards achievement of Program Outcomes & Strength of correlations (3:High, 2: Medium, 1:Low)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3		1				3						1	
CO2	3		1				3						1	
CO3	3		1				3						1	
CO4	3		1				3						1	
CO5	3		1				3						1	
CO6	3		1				3			3			1	

Syllabus

Expt. No.	Syllabus	Mapped CO's
1	Determination of strength of an acid by pH metric method	CO1,CO6
2	Determination of conductance by conducto metric method	
3	Determination of viscosity of a liquid	CO4,CO6
4	Determination of surface tension of a liquid	
5	Determination of chromium (VI) in potassium dichromate	CO2,CO6
6	Determination of Zinc by EDTA method	
7	Estimation of active chlorine content in Bleaching powder	CO3,CO6
8	Preparation of Phenol-Formaldehyde resin	CO5,CO6
9	Preparation of Urea-Formaldehyde resin	
10	Thin layer chromatography(paper chromatography)	

Learning Resources

Text Books

1. N.KBhasin and Sudha Rani Laboratory Manual on Engineering Chemistry 3/e, DhanpatRai Publishing Company (2007).

Reference Books

1. Mendham J, Denney RC, Barnes JD, Thosmas M and Sivasankar B Vogel's Quantitative Chemical Analysis 6/e, Pearson publishers (2000).

e- Resources & other digital material

1. https://nptel.ac.in/courses/105105178/
2. http://202.53.81.118/course/view.php?id=82

Programming for Problem Solving Lab

Course Code	20ES1253	**Year**	I	**Semester**	II
Course Category	Engineering Science	**Branch**	IT	**Course Type**	Lab
Credits	1.5	**L-T-P**	0-0-3	**Prerequisites**	Nil
Continuous Internal Evaluation	15	**Semester End Evaluation**	35	**Total Marks**	50

Course Outcomes

Upon successful completion of the course, the student will be able to (L3)

CO1	Apply Structured Programming/C constructs for solving problems (L3).
CO2	Implement programs as an individual on different IDEs/ online platforms. (L3)
CO3	Develop an effective report based on various programs implemented. (L3)
CO4	Apply technical knowledge for a given problem and express with an effective oral communication. (L4)
CO5	Analyze outputs using given constraints/test cases.

Contribution of Course Outcomes towards achievement of Program Outcomes & Strength of correlations (3:High, 2: Medium, 1:Low)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3											2	2	2
CO2					3				3				2	2
CO3										3				
CO4	3									3				
CO5		3												

Syllabus

Expt. No.	Syllabus	Mapped CO's
1	Draw flowcharts for fundamental algorithms.	CO1 - CO5
2	C Programs to demonstrate C-tokens.	CO1 - CO5
3	C Programs on usage of operators.	CO1 - CO5
4	C Programs to demonstrate Decision making and branching (Selection)	CO1 - CO5
5	C programs to demonstrate different loops.	CO1 - CO5
6	C programs to demonstrate 1-D arrays.	CO1 - CO5
7	C programs to demonstrate multi-dimensional arrays.	CO1 - CO5
8	C programs to perform operations on strings with String handling functions and without String handling functions.	CO1 - CO5
9	C programs to demonstrate functions.	CO1 - CO5
10	C programs on pointers.	CO1 - CO5
11	C programs on structures and unions.	CO1 - CO5
12	C programs to demonstrate files.	CO1 - CO5

Learning Resources
Text Books
1. Programming in C, Reema Thareja, AICTE Edition, 2018, Oxford University Press
Reference Books
1. Computer Science: A Structured Programming Approach Using C, B. A. Forouzan and R.F. Gilberg, Third Edition, 2007, Cengage Learning. 2. Programming in C, Pradip Dey, Manas Ghosh, AICTE Edition, Oxford University Press. 3. Programming with C, B. Gottfried, Third Edition, 2017, Schaum's outlines, McGraw Hill (India). 4. Problem Solving and Program Design in C, Jeri R. Hanly, Ellot B. Koffman, Fifth Edition, Pearson.
e- Resources & other digital material
1. http://cprogramminglanguage.net/ 2. https://www.geeksforgeeks.org/c-programming-language/ 3. https://nptel.ac.in/courses/106105085/4

Life Sciences for Engineers

Course Code	20MC1201	**Year**	I	**Semester**	II
Course Category	Mandatory	**Branch**	IT	**Course Type**	Theory
Credits	0	**L-T-P**	2-0-2	**Prerequisites**	Nil
Continuous Internal Evaluation	30	**Semester End Evaluation**	70	**Total Marks**	100

Course Outcomes

Upon successful completion of the course, the student will be able to

CO1	**Apply** the concepts of biology to create tangible and economically viable engineering goods.((L3)
CO2	**Analyse** new technologies in Genetics biotechnology, pharmaceutical, medical and agricultural fields from the knowledge gained from DNA technology.(L4)
CO3	**Apply** the knowledge of biology to improve the living standards of societies.(L3)
CO4	**Apply** the basic knowledge of genetics and DNA technology for disease diagnostics and therapy.(L3)
CO5	**Analyse** new technologies in biotechnology, pharmaceutical, medical and agricultural fields from the knowledge gained from DNA technology.(L4)

Contribution of Course Outcomes towards achievement of Program Outcomes & Strength of correlations (3:High, 2: Medium, 1:Low)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3									2				
CO2					3					2				
CO3					3					2				
CO4					3	3				2				
CO5	3					3				2				

Syllabus

Unit No.	Syllabus	Mapped CO's
1	**Introduction to Biology** Comparison of Biological organisms with manmade systems :Eye and Camera ,Flying bird and Aircraft Ultra structure of cell: Prokaryotes and Eukaryotes	CO1
2	**Bio-molecules** Structure and functions of proteins (antibodies) Structure and functions of nucleic acids Industrial applications- Enzymes and Fermentation	CO1 CO2
3	**Bioenergetics and Cellular Respiration** Mechanism of photosynthesisGlycolysis TCA cycle Electron transport chain and Oxidative phosphorylation.	CO3
4	**Genetics** Mendel'slaws Gene mapping Single gene disorders in humans	CO3 CO4
5	**Recombinant DNA Technology** Recombinant vaccines, transgenic microbes, plants and animals. Animal cloning, biosensors, biochips.	CO2 CO5

Expt. No.	Name of the experiment	Mapped CO's
1	Dissect & mount different parts of plants using Microscope	CO1
2	Estimation of Proteins by using Biuret method	CO2
3	Estimation of enzyme activity.	CO2
4	Estimation of chlorophyll content in some selected plants.	CO3
5	Nitrogen Cycle: Estimation of Nitrates /Nitrites in soil by using Spectrophotometer	CO3
6	Mendal's laws and gene mapping	CO4, CO5

Learning Resources

Text Books

1. Biology for Engineers-Wiley Editorial
2. N. A. Campbell, J. B. Reece, L. Urry, M. L. Cain and S. A. Wasserman, "Biology: A global approach", Pearson Education Ltd, 2018.
3. Biotechnology by U.Satyanarayana, Alliedand books Pvt. ltd. Kolkata

Reference Books

1. Alberts et al., The molecular biology of the cell, 6/e, Garland Science, 2014.
2. John Enderle and Joseph Bronzino Introduction to Biomedical Engineering, 3/e, 2012

PVP SIDDHARTHA INSTITUTE OF TECHNOLOGY, KANURU, VIJAYAWADA
(AUTONOMOUS)
INFORMATION TECHNOLOGY

Engineering Mathematics III
(Discrete Mathematical Structures)
(Common to CSE & IT)

Course Code	20BS1303	**Year**	II	**Semester**	I
Course Category	BS	**Branch**	IT	**Course Type**	Theory
Credits	3	**L-T-P**	3-0-0	**Prerequisites**	Basic Mathematics
Continuous Evaluation :	30	**Semester End Evaluation:**	70	**Total Marks:**	100

Course Outcomes		
Upon successful completion of the course, the student will be able to		
CO1	Understand the fundamental concepts of discrete mathematical structures	**L2**
CO2	Apply Normal forms/Rules of Inference for solving suitable problems.	**L3**
CO3	Apply the method of characteristic roots for solving different recurrence relations.	**L3**
CO4	Analyze various graph techniques to construct a tree.	**L4**

Contribution of Course Outcomes towards achievement of Program Outcomes & Strength of correlations (3:Substantial, 2: Moderate, 1:Slight)

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	3													
CO2	2									1				
CO3										1			2	
CO4		3							1	1				

Syllabus		
Unit No.	**Contents**	**Mapped CO**
I	**Mathematical Logic:** Introduction –Statements and Notations - Connectives (Negation, Conjunction, Disjunction)- Statement formulas and Truth Tables, Conditional and Bi-conditional, Well-Formed Formulas, Tautologies, Equivalence of Formulas, Duality Law, Tautological Implication, Functionally Complete Sets of Connectives, Other Connectives. **Normal Forms:** Disjunctive Normal Forms (DNF), Conjunctive Normal Forms (CNF), Principal of Disjunctive Normal Forms (PDNF), Principal of ConjunctiveNormal Forms (PCNF).	**CO1, CO2**
II	**Theory of Inference for Statement Calculus:** Validity using Truth Tables-Rules of Inference – Consistency of Premisesand Indirect Method Proof. **Predicate calculus:** Introduction to Predicates - Statement functions, Variable and Quantifiers - Predicate Formulas - Free and Bound Variables-Universe of Discourse.	**CO1,CO2**
III	**Recurrence Relations:** The Method of Characteristic Recurrence Relation. Roots – Solutions in Inhomogeneous	**CO1,CO3**
IV	**Relations and Directed Graphs:** Special Properties of Binary Relations-Equivalence Relations- Ordering Relations, Lattices, and Enumerations-Operations on Relations- Paths and Closures-Directed Graphs and Adjacency Matrices.	**CO1,CO4**
V	**Graphs:** Basic Concepts- Isomorphism's and Sub graphs-Trees and Their Properties - Spanning Trees-Planar Graphs-Euler's Formula- Multi-graphs and Euler Circuits-Hamiltonian Graphs- Chromatic Numbers.	**CO1,CO4**

Learning Resources
Text Books
1. Discrete Mathematical Structures with Applications to Computer Science, J P Trembly andR Manohar, 1988, McGraw-Hill **(Unit-I,II)** 2. Discrete Mathematics for Computer Scientists & Mathematicians, Joe L. Mott. Abraham Kandel and Theodore P. Baker, Second Edition, 2017, PHI. **(Unit-III,IV,V)**
References
1. Discrete Mathematics and its Applications, Kenneth H. Rosen, Seventh Edition, 2017,McGraw-Hill.
e-Resources & other digital material
1. https://www.geeksforgeeks.org/engineering-mathematics-tutorials/ 2. https://www.tutorialspoint.com/discrete_mathematics/index.htm 3. http://www.alas.matf.bg.ac.rs/~mi10164/Materijali/DS.pdf 4. https://nptel.ac.in/courses/111107058/

PVP SIDDHARTHA INSTITUTE OF TECHNOLOGY, KANURU, VIJAYAWADA (AUTONOMOUS)
INFORMATION TECHNOLOGY

Data Structures
(Common to CSE & IT)

Course Code	20ES1305	**Year**	II	**Semester**	I
Course Category	ES	**Branch**	IT	**Course Type**	Theory
Credits	3	**L-T-P**	3-0-0	**Prerequisites**	Programming for Problem Solving
Continuous Internal Evaluation	30	**Semester End Evaluation**	70	**Total Marks**	100

Course Outcomes		
Upon successful completion of the course, the student will be able to		
CO1	Understand the basic concepts of algorithm complexities, recursion and data structures.	**L2**
CO2	Apply suitable searching, sorting algorithms for various applications.	**L3**
CO3	Apply suitable data structure to solve the problems.	**L3**
CO4	Analyze the problem to construct an algorithm using suitable data structure.(Assignment)	**L4**

Contribution of Course Outcomes towards achievement of Program Outcomes & Strength of correlations (3:Substantial, 2: Moderate, 1:Slight)

	PO1	PO2	PO 3	PO4	PO 5	PO6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO1	PSO2
CO1	3													
CO2	3								2	2		3	3	3
CO3	3								1	1		3	3	3
CO4		3							1	1		3	3	3

Syllabus		
Unit No	**Contents**	**Mapped CO**
I	**Introduction:** Algorithm Specification, Time complexity & space complexity and their notations. **Recursion:** What is Recursion, Why Recursion, Format of a Recursive function, Recursion andmemory, Recursion Vs Iteration, Examples. **Sorting and Searching:** Searching- Linear and Binary search algorithms. Sorting-Bubble, Insertion, Selection, Merge, Quick sort algorithms.	**CO1, CO2**
II	**Linked lists:** Single linked list, double linked list, circular linked list, and operations on linkedlists.	**CO1, CO3, CO4**
III	**Stacks:** Definition, operations: array implementation, linked list implementation and applications. **Queues:** Definition, operations: array implementation, linked list implementation and applications, Circular Queue.	**CO1, CO3, CO4**
IV	**Trees:** Introduction- Terminology, representation of trees, binary trees abstract data type, Properties of binary trees, binary tree representation, binary tree traversals In order, preorder, post order, Binary search trees Definition, searching BST, insert into BST, delete from a BST, Height of a BST.	**CO1, CO3, CO4**
V	**Graphs:** The Graph ADT Introduction, definition, graph representation, elementary graphoperations BFS, DFS, Minimum Spanning Tree – only: Prim's and Kruskal's MST.	**CO1, CO3, CO4**

Learning Resources

Text Books

1. *Data Structures and Algorithm Analysis in C*, Mark Allen Weiss, Second Edition, 2002, Pearson.
2. *Introduction to Algorithms*, Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, Clifford Stein, Third Edition, 2010, PHI.
3. *Data Structures and Algorithms Made Easy* by Narasimha Karumanchi, 2020, CareerMonk Publications.

References

1. *Fundamental of Data Structures in C*, Horowitz, Sahani, Anderson-Freed, Second Edition, 2008, Universities Press.
2. *Classic Data Structures*, Debasis Samantha, Second Edition, 2009, PHI.

e-Resources & other digital material

1. http://cse.iitkgp.ac.in/pds/
2. http://cmpe.emu.edu.tr/bayram/courses/231/LectureNotesSlides/IQBAL/Lecture%20Notes
3. https://www.geeksforgeeks.org/data-structures/
4. https://www.programiz.com/dsa
5. https://www.tutorialspoint.com/data_structures_algorithms/index.htm
6. https://www.youtube.com/watch?v=zWg7U0OEAoE&list=PLBF3763AF2E1C572F
7. https://www.youtube.com/watch?v=S47aSEqm_0I&list=PLgj_V-ZKxRKrxgFyOutPJpoLFBaQMOpK-

PVP SIDDHARTHA INSTITUTE OF TECHNOLOGY, KANURU, VIJAYAWADA
(AUTONOMOUS)
INFORMATION TECHNOLOGY
Fundamentals of Digital Logic Design
(Common to CSE & IT)

Course Code	20IT3301	**Year**	II	**Semester**	I
Course Category	PC	**Branch**	IT	**Course Type**	Theory
Credits	3	**L-T-P**	3-0-0	**Prerequisites**	Basic Electrical &Electronics Engg.
Continuous Internal Evaluation	30	**Semester End Evaluation**	70	**Total Marks**	100

Course Outcomes		
Upon successful completion of the course, the student will be able to		
CO1	Understand the basic concepts of digital circuits.	**L2**
CO2	Apply minimization techniques to simplify Boolean expressions.	**L3**
CO3	Apply the principles of digital electronics to design combinational and sequential circuits.	**L3**
CO4	Analyze the functionality of combinational circuits and sequential circuits.	**L4**

Contribution of Course Outcomes towards achievement of Program Outcomes & Strength of correlations (3:Substantial, 2: Moderate, 1:Slight)

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO 6**	**PO 7**	**PO 8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	3													
CO2	3								3	3			3	
CO3	3								3	3			3	
CO4		3							3	3			3	

Syllabus		
Unit No	**Contents**	**Mapped CO**
I	**Digital Systems and Binary Numbers:** Digital Systems, Binary Numbers, Number Base Conversions, Octal and Hexadecimal Numbers, Complements of Numbers, Signed Binary Numbers, Binary codes and Binary Logic.	**CO1**
II	**Boolean Algebra and Logic Gates:** Introduction, Basic Definitions, Axiomatic definition of Boolean Algebra, Basic theorems and properties of Boolean Algebra, Boolean functions, Canonical and Standard Forms. **Gate–Level Minimization :** Introduction, Map Method-Two variable, Three variable K-map's, Four Variable K-Map, Product of Sums Simplification, Don't Care Conditions,NAND and NOR implementation.	**CO1,CO2**
III	**Combinational Logic:** Introduction, Combinational Circuit, Analysis Procedure, Design Procedure, Binary adder- sub tractor, Decimal Adder, BCD to Seven Segment Display, Encoders, Decoder, Multiplexers, Demultiplexers.	**CO1, CO3,CO4**
IV	**Sequential Logic:** Introduction, Storage Elements: Latches –SR, D Latches Storage Elements: Flip Flops–SR, JK, D and T Flip Flops, Characteristic tables, Characteristic equation, Excitation tables.	**CO1, CO3, CO4**
V	**Registers and Counters:** Registers, Shift Registers- Serial Transfer, Serial Addition, Universal Shift Register, Ripple Counters-Binary Ripple Counter, BCD Ripple Counter, Synchronous Counters-Binary Counter, Up–Down Binary Counter, BCD Counter, Binary Counter with Parallel Load Other Counters- Ring counter, Johnson counter.	**CO1, CO3, CO4**

Learning Resources

Text Books

1. *Digital Design*, M. Morris Mano, Michael D.Ciletti, Fifth Edition, 2013, Pearson.

References

1. *Switching Theory and Finite Automata*, Zvi. Kohavi, Niraj K. Jha, Third Edition, 2010, Cambridge, University Press.
2. *Fundamentals of Digital circuits*, A. Anand Kumar, Third Edition, 2013, PHI.

e-Resources & other digital material

1. https://nptel.ac.in/courses/106/108/106108099/http://nptel.ac.in/courses/117106086/1
2. https://nptel.ac.in/courses/117/105/117105080/
3. https://www.udemy.com/course/digital-electronics-logic-design/
4. https://learnabout-electronics.org/Digital/dig20.php
5. https://www.tutorialspoint.com/digital_circuits/digital_circuits_logic_gates.htm
6. https://www.geeksforgeeks.org/digital-electronics-logic-design-tutorials/

PVP SIDDHARTHA INSTITUTE OF TECHNOLOGY, KANURU, VIJAYAWADA
(AUTONOMOUS)
INFORMATION TECHNOLOGY

SOFTWARE ENGINEERING

Course Code	20IT3302	**Year**	II	**Semester**	I
Course Category	PC	**Branch**	IT	**Course Type**	Theory
Credits	3	**L-T-P**	3-0-0	**Prerequisites**	Basics of IT
Continuous Internal Evaluation	30	**Semester End Evaluation**	70	**Total Marks**	100

Course Outcomes		**Blooms Taxonomy Level**
Upon Successful completion of course, the student will be able to		
CO1	Understand the process of software engineering and various process models.	L2
CO2	Design the requirements of software system.	L3
CO3	Use various design elements to prepare software system.	L3
CO4	Analyze various testing techniques.	L3

Contribution of Course Outcomes towards achievement of Program Outcomes & Strength of correlations (H:High, M: Medium, L:Low)

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	3						3						3	
CO2	3	3	3				3				3		3	
CO3	3	3	3				3				3		3	
CO4	3						3				3		3	

Syllabus		
Unit No	**Contents**	**Mapped CO**
I	**Software and Software Engineering:** The Nature of Software, The Unique Nature of WebApps, Software Engineering, Software Process, Software Engineering Practice, Software Myths. **Process Models:** A Generic Process Model: Defining a frame work activity, Prescriptive Process Models: The Waterfall Model, Incremental Process Model, Evolutionary Process Model, The Unified Process, What is an Agile Process? XP Process.	**CO1**
II	**Requirements Analysis And Specification:** Requirements Gathering and Analysis, Software Requirement Specification (SRS): Characteristics of good SRS, Functional Requirements, Organization of SRS. **Software Design:** Overview of the Design Process, How to Characterize of a Design? Cohesion and Coupling, Approaches to Software Design.	**CO2, CO3**
III	**Function-Oriented Software Design:** Overview of SA/SD Methodology, Structured Analysis, Structured Design, Detailed Design, Design Review. **User Interface Design**: Characteristics of Good User Interface, Basic Concepts, Types of User Interfaces, A User Interface Design Methodology.	**CO1, CO3**
IV	**Coding And Testing:** Coding, Code Review, Software Documentation, Testing, Unit Testing, Black-Box Testing, White-Box Testing, Debugging, Integration Testing, System Testing.	**CO1, CO4**
V	**Software Reliability And Quality Management:** Software Reliability, Statistical Testing, Software Quality, Software Quality Management System. **Software Maintenance:** Software maintenance, Maintenance Process Models, Maintenance Cost. **Software Reuse**: what can be reused? Why almost No Reuse So Far? Basic Issues in Reuse Approach.	**CO1, CO4**

Learning Resources
Text Books
1. *Software Engineering - A Practitioner's Approach*, Roger S. Pressman, Seventh Edition McGrawHill International Edition. 2. *Fundamentals of Software Engineering*, Rajib Mall, Third Edition,PHI.
References
1. *Software Engineering : A Primer*, Waman S Jawadekar, Tata McGraw-Hill,2008 2. *Software Engineering, A Precise Approach*, PankajJalote, WileyIndia,2010. 3. *Software Engineering, Principles and Practices*, Deepak Jain, Oxford University Press.
E-Resources and other Digital Material
1. https://nptel.ac.in/courses/106101061/

PVP SIDDHARTHA INSTITUTE OF TECHNOLOGY, KANURU, VIJAYAWADA
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INFORMATION TECHNOLOGY
OBJECT ORIENTED PROGRAMMING THROUGH C++
(Common to CSE & IT)

Course Code	20IT3303	**Year**	II	**Semester**	I
Course Category	PC	**Branch**	IT	**Course Type**	Theory
Credits	3	**L-T-P**	3-0-0	**Prerequisites**	Programming for Problem Solving
Continuous Internal Evaluation	30	**Semester End Evaluation**	70	**Total Marks**	100

COURSE OUTCOMES

Upon successful completion of the course, Student will be able to

CO1	Understand the principles of OOP and the key features of C++.	**L2**
CO2	Apply object oriented concepts to develop solution for the given problem.	**L3**
CO3	Apply functions as per the problem requirement.	**L3**
CO4	Analyze the given scenario and use appropriate generic programming aspects / exception handling mechanisms to solve the problem.	**L4**

Contribution of Course Outcomes towards achievement of Program Outcomes & Strength of correlations (H:High, M: Medium, L:Low)

	PO1	PO2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO1	PSO2
CO1	3												3	3
CO2	3								3	3			3	3
CO3	3								3	3			3	3
CO4		3							3	3			3	3

SYLLABUS

Unit No.	CONTENTS	Mapped CO
I	**Introduction:** Difference between C and C++, Evolution of C++, Programming Paradigms, Key concepts of OOP, Advantages of OOP, Usage of OOP. **I/O in C++:**Pre-defined streams, stream classes, Scope access operator, Name space, memory management operators. **Functions:** Introduction, Parts of a function, Passing arguments, Return by reference, Returning more values by reference, Default arguments, const arguments, Inline functions, Function overloading.	**CO1, CO3**
II	**Classes and Objects :**classes in C++, Declaring objects, Access specifiers and their scope, Defining Member Functions, Characteristics of member functions, Outside member function as inline, rules for Inline functions, static member	**CO1, CO2, CO3**

	variables, static member functions, static objects, object as function arguments, Friend Function. **Constructors and Destructors:** Constructors and Destructors, characteristics of constructors and destructors, Applications with constructors, Parameterized constructors, Multiple constructors, copy constructors, destructors, calling constructors and destructors. **Operator Overloading:** The keyword operator, Overloading Unary Operators, Overloading binary operators, Rules for Overloading operators, Overloading Friend function.	
III	**Inheritance:** Access specifiers and simple inheritance, protected data with private inheritance, Types of Inheritance: Single, Multilevel, Multiple, Hierarchical, Hybrid and Multipath, Virtual Base Classes. Pointers: void pointer, wild pointer, this pointer. **Binding, Polymorphism, and Virtual Functions:** Binding in C++, Pointer to Base and Derived class, Virtual Function, Rules for Virtual functions, Pure Virtual Functions, Abstract Class.	**CO1, CO2, CO3**
IV	**Files**: Introduction, File stream classes, Steps for file operations, Checking for errors, Finding end of file, File opening modes, File pointers and manipulators. **Exception Handling:** Principles of Exception Handling, The Keywords try, throw and catch, Guidelines for Exception Handling, Multiple catch statements, Catching Multiple Exceptions, Re-Throwing Exceptions, Specifying Exceptions.	**CO1, CO2, CO3, CO4**
V	**Generic Programming with Templates:** Need for Templates, Definition of class Templates, Function Template, Working of Function Templates, Class Template with more parameters, Function Template with more parameters. **Standard Template Library:** Introduction to STL, STL Programming model, containers, sequence container: vector, list; Associative containers: set, map; Algorithms: sort, search, find; Iterators.	**CO1, CO2, CO3, CO4**

Learning Resources

Text Books

1. *Programming in C++*, Ashok N. Kamthane, 2nd Edition, 2013, Pearson.

References

1. *The C++ Programming Language*, BjarneStroustup, 4th Edition, 2013, Addison-Wesley.
2. *Object-Oriented Programming Using C++ Paperback*, Joyce Farrell, 4th Edition, 2013, Cengage.

e-Resources and other Digital Material

1. https://www.learncpp.com/
2. https://onlinecourses.nptel.ac.in/noc21_cs02/preview
3. https://www.educative.io/courses/learn-object-oriented-programming-in-cpp
4. https://www.youtube.com/watch?v=wN0x9eZLix4 (Learn Object Oriented Programming in C++, Beau Carnes, February 2021)
5. https://www.geeksforgeeks.org/the-c-standard-template-library-stl/

PVP SIDDHARTHA INSTITUTE OF TECHNOLOGY, KANURU, VIJAYAWADA
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INFORMATION TECHNOLOGY
Data Structures Lab
(Common to CSE & IT)

Course Code	20ES1356	**Year**	II	**Semester**	I
Course Category	ES Lab	**Branch**	IT	**Course Type**	Practical
Credits	1.5	**L-T-P**	0-0-3	**Prerequisites**	Programming for Problem Solving
Continuous Internal Evaluation	15	**Semester end evaluation**	35	**Total Marks**	50

Course Outcomes		
Upon successful completion of the course, the student will be able to		
CO1	Apply Linear and non-linear data structures for solving problems.	**L2**
CO2	Implement programs as an individual on different IDEs	**L3**
CO3	Develop an effective report based on various programs implemented	**L3**
CO4	Apply technical knowledge for a given problem and express with an effective oral communication	**L3**
CO5	Analyze outputs using given constraints/test cases	**L4**

Contribution of Course Outcomes towards achievement of Program Outcomes & Strength of correlations (3:Substantial, 2: Moderate, 1:Slight)

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	2											2	2	2
CO2					3				3					
CO3										3				
CO4	1									1				
CO5		3												

Syllabus		
Expt No	**Contents**	**Mapped CO**
1.	Demonstrate recursive algorithms with examples.	**CO1 - CO5**
2.	Implement various searching techniques.	**CO1 - CO5**
3.	Develop programs for different sorting techniques	**CO1 - CO5**
4.	Implement and perform different operations on Single, Double and Circular Linked Lists.	**CO1 - CO5**
5.	Develop a program to perform operations of a Stack using arrays and linked Lists.	**CO1 - CO5**
6.	Develop programs to implement Stack applications.	**CO1 - CO5**
7.	Develop a program to perform operations of Linear Queue using arrays and linked Lists.	**CO1 - CO5**
8.	Implement Circular Queues.	**CO1 - CO5**
9.	Develop a program to represent a tree data structure.	**CO1 - CO5**
10.	Develop a program to demonstrate operations on Binary Search Tree.	**CO1 - CO5**
11.	Demonstrate Graph Traversal Techniques.	**CO1 - CO5**
12.	Develop a program to find Minimum cost Spanning tree.	**CO1 - CO5**

Learning Resources

Text Books

1. *Data Structures and Algorithm Analysis in C*, Mark Allen Weiss, Second Edition, 2002, Pearson.
2. *Introduction to Algorithms*, Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, Clifford Stein, Third Edition, 2010, PHI.
3. *Data Structures and Algorithms Made Easy* by Narasimha Karumanchi, 2020, CareerMonk Publications.

e-Resources & other digital material

1. https://www.cs.usfca.edu/~galles/visualization/Algorithms.html
2. http://www.algomation.com/algorithm/single-linked-list-insert-delete
3. http://www.algomation.com/algorithm/binary-tree-insert-delete-display
4. https://www.youtube.com/watch?v=AfYqN3fGapc
5. https://www.youtube.com/watch?v=7vw2iIdqHlM
6. http://littlesvr.ca/dsa-html5-animations/sorting.php

PVP SIDDHARTHA INSTITUTE OF TECHNOLOGY, KANURU, VIJAYAWADA
(AUTONOMOUS)
INFORMATION TECHNOLOGY

SOFTWARE ENGINEERING LAB

Course Code	20IT3351	**Year**	II	**Semester**	I
Course Category	PC Lab	**Branch**	IT	**Course Type**	Lab
Credits	1.5	**L-T-P**	0-0-3	**Prerequisites**	--
Continuous Internal Evaluation	15	**Semester End Evaluation**	35	**Total Marks**	50

Course Outcomes		
Upon successful completion of the course, the student will be able		
CO1	To demonstrate requirement gathering techniques to analyze the problem and prepare SRS.	**L4**
CO2	To investigate a real-world problem using modern modelling tools.	**L3**
CO3	To estimate the cost, size, effort on a defined problem.	**L3**
CO4	To formulate test cases based on requirements and design and performing testing.	**L3**

CO/ PO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**P011**	**PO12**	**PSO1**	**PSO2**
CO1	3	3							3	3			3	3
CO2	3		3		3				3	3			3	3
CO3	3	3							3	3			3	3
CO4	3				3				3	3			3	3

Course Content
For the below scenarios apply the experiments:
Case Study 1: Banking System
Case Study 2: Business Application

Expt. No.	Contents	Mapped CO
1	Performing Problem Analysis.	CO1
2	Do the Requirement Analysis and Prepare SRS.	CO1
3	Identification of actors, use cases and construction of use case diagram.	CO2
4	Identification of classes, attributes and relationships of classes.	CO2
5	Construction of class diagram.	CO2
6	Using COCOMO model estimate effort.	CO3
7	Calculate effort using FP oriented estimation model.	CO3
8	Design of Test cases based on requirements and design.	CO4
9	Perform black box testing using a testing tool.	CO4

Learning Resources

Text Books

1. Roger S. Pressman, *Software engineering-A practitioner's Approach*, McGraw-Hill International Edition, Seventh edition,2009.

2. Grady Booch , James Rumbaugh , Ivar Jacobson- *The Unified Modeling Language User Guide*, Pearson education, Second edition, 2005.

References

1.IanSommerville, Software engineering, Pearson education Asia, Tenth edition, 2017

e-Resources and other Digital Material

1. https://nptel.ac.in/courses/106/105/106105182/
2. https://nptel.ac.in/courses/106/105/106105224

PVP SIDDHARTHA INSTITUTE OF TECHNOLOGY, KANURU, VIJAYAWADA

(AUTONOMOUS)
INFORMATION TECHNOLOGY
OBJECT ORIENTED PROGRAMMING THROUGH C++ Lab
(Common to CSE & IT)

Course Code	20IT3352	**Year**	II	**Semester**	I
Course Category	PC Lab	**Branch**	IT	**Course Type**	Lab
Credits	1.5	**L-T-P**	0-0-3	**Prerequisites**	Programming for Problem Solving
Continuous Internal Evaluation	15	**Semester End Evaluation**	35	**Total Marks**	50

Course Outcomes		
Upon successful completion of the course, the student will be able to		
CO1	Apply Object oriented principles/ C++ constructs for solving problems.	**L2**
CO2	Implement programs as an individual on different IDEs/ online platforms.	**L2**
CO3	Develop an effective report based on various programs implemented.	**L2**
CO4	Apply technical knowledge for a given problem and express with an effective oral communication.	**L3**
CO5	Analyze outputs using given constraints/test cases.	**L4**

Contribution of Course Outcomes towards achievement of Program Outcomes & Strength of correlations (H:High, M: Medium, L:Low)

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	2												2	2
CO2					3				3				3	3
CO3										3				
CO4	2									2			2	
CO5		2											2	2

SYLLABUS		
Sl. No.	**CONTENTS**	**Mapped CO**
1	Implement programs on predefined streams.	CO1-CO5
2	Implement programs using functions (passing arguments, overloading).	CO1-CO5
3	Implement programs using class/object concepts. (Access specifiers, class members, static members)	CO1-CO5
4	Implement programs using friend functions.	CO1-CO5
5	Implement programs using constructor(s) and destructor.	CO1-CO5
6	Implement programs using operator overloading.	CO1-CO5
7	Implement various types of inheritance techniques.	CO1-CO5
8	Implement programs using virtual functions to achieve polymorphism.	CO1-CO5
9	Implement programs using File Streams	CO1-CO5
10	Implement programs on exception handling concepts.	CO1-CO5
11	Implement programs on generic programming concept with templates.	CO1-CO5
12	Implement containers in C++ (Sequence Containers and Associative Containers).	CO1-CO5

Learning Resources

Text Books

1. *Programming in C++*, Ashok N. Kamthane, 2nd Edition, 2013, Pearson.

References

1. *The C++ Programming Language*, BjarneStroustup, 4th Edition, 2013, Addison-Wesley.
2. *Object-Oriented Programming Using C++ Paperback*, Joyce Farrell, 4th Edition, 2013, Cengage.

e-Resources and other Digital Material

1. https://www.learncpp.com/
2. https://onlinecourses.nptel.ac.in/noc21_cs02/preview
3. https://www.educative.io/courses/learn-object-oriented-programming-in-cpp
4. https://www.youtube.com/watch?v=wN0x9eZLix4 (Learn Object Oriented Programming in C++, Beau Carnes, February 2021)
5. https://www.geeksforgeeks.org/the-c-standard-template-library-stl/

PVP SIDDHARTHA INSTITUTE OF TECHNOLOGY, KANURU, VIJAYAWADA
(AUTONOMOUS)
INFORMATION TECHNOLOGY

USER EXPERIENCE (UX) DESIGN

Course Code	20SO8356	**Year**	II	**Semester**	I
Course Category	SC	**Branch**	IT	**Course Type**	Lab
Credits	2	**L-T-P**	1-0-2	**Prerequisites**	-
Continuous Internal Evaluation	-	**Semester End Evaluation**	50	**Total Marks**	50

Course Outcomes		
Upon Successful completion of course, the student will be able to		
CO1	Identify the significance of user experience and interaction design and recognize various aspects of Adobe XD workspace.	L2
CO2	Use various drawing tools used in UX design.	L3
CO3	Demonstrate various operations on Text and Images in UX design.	L3
CO4	Discover the process of UX design for Mobile	L3
CO5	Demonstration of designing wireframes and prototypes for Mobile and Web applications.	L3

Contribution of Course Outcomes towards achievement of Program Outcomes & Strength of correlations (3:High, 2: Medium, 1:Low)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3													3
CO2					3									3
CO3				3										3
CO4				3										3
CO5			3											3

<table>
<tr><th colspan="3">Syllabus</th></tr>
<tr><th>Unit No</th><th>Contents</th><th>Mapped CO</th></tr>
<tr><td>I</td><td>Overview of Web and Mobile Design Process: Challenges of Designing, designing for screens, Designing for Interaction. Introduction to Adobe (XD) Experience Design – Design and Prototype workspace in Adobe XD, Using Keyboard.
Practical Exercises:
1. Identify and explore Adobe XD interface, Workspaces, various panels, menus.</td><td>CO1</td></tr>
<tr><td>II</td><td>Using Adobe XD's Drawing tools: Adding Shapes, Shapes and Properties, stacking order, Working with Layers, Combining Objects into symbols, Drawing objects with Pen tool
Practical Exercises:
1.Practice different shapes available in Adobe XD and explore their properties.
2.Exercise on stacking various shapes and working with layers. Exercise on combining objects to form symbols/components like Textboxes, Buttons,
3.Dropdown lists, Checkboxes, Radio boxes.
4.Exercise on drawing different shapes using Pen tool.</td><td>CO2</td></tr>
<tr><td>III</td><td>Working with Text and Images: Understanding fonts, Formatting Text, Text bestpractices. Image File Types, Scaling and rotation, working with SVG
Practical Exercises:
1.Exercise on formatting text with best practices and fonts.
2.Exercise on working with images: scaling rotation, working with SVG.</td><td>CO3</td></tr>
<tr><td>IV</td><td>Artboard and Content Grids: Artboard basics, creating place holders, Repeat Grid, Formatting placeholders. Designing for Mobile - Responsive web design, Creating App designs, Mobile Web designs.
Practical Exercises:
1. Exercise on using Artboards, grids and placeholders.
2. Exercise on Mobile and Responsive design.</td><td>CO4</td></tr>
<tr><td>V</td><td>Creating Interactive Prototypes: Prototype workspace, creating links – Interacting limitations, Previewing Prototypes – Desktop & Mobile, Using prototypes for Usability Tests.
Practical Exercises:
1. Create a wireframe for any sample application (Web and Mobile).
2. Create a prototype for the above designed wireframes with interactions.</td><td>CO5</td></tr>
<tr><td colspan="3">Learning Recourses</td></tr>
<tr><td colspan="3">Text Books</td></tr>
<tr><td colspan="3">1. Beginning Adobe Experience Design: Quickly Design and Prototype Websites and Mobile Apps, by Rob Huddleston, Apress.</td></tr>
<tr><td colspan="3">References</td></tr>
<tr><td colspan="3">1. Jump Start Adobe XD, by Daniel Schwarz, Sitepoint.</td></tr>
<tr><td colspan="3">E-Recourses and other Digital Material</td></tr>
<tr><td colspan="3">1. The Basics of User Experience Design - Ebook, by Interaction Design Foundation.https://www.interaction-design.org/ebook
2. UI/UX Design Specialization – Coursera: https://www.coursera.org/specializations/ui-ux-design
3. UX Prototyping – edX - https://www.edx.org/course/ux-prototyping</td></tr>
</table>

PVP SIDDHARTHA INSTITUTE OF TECHNOLOGY, KANURU, VIJAYAWADA (AUTONOMOUS)

INFORMATION TECHNOLOGY

ENVIRONMENTAL SCIENCE

(COMMON TO ALL BRANCHES)

Course Code	20MC1301	**Year**	II	**Semester**	I
Course Category	MC	**Branch**	IT	**Course Type**	Theory
Credits	0	**L-T-P**	2-0-0	**Prerequisites**	--
Continuous Internal Evaluation	30	**Semester End Evaluation**	70	**Total Marks**	100

Course Outcomes		**Blooms Taxonomy Level**
Upon Successful completion of course, the student will be able to		
CO1	Apply advanced solutions to measure the threats and hazards in environment to link with human natural systems.	L3
CO2	Analyze the ethical, cultural and historical interactions between man and environment.	L4
CO3	Analyze various environmental assets and record for better management	L4
CO4	Analyze global issues to design and evaluate policies	L4
CO5	Apply system concepts to methodological social and environmental issues	L3

Contribution of Course Outcomes towards achievement of Program Outcomes & Strength of correlations (H:High, M: Medium, L:Low)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3						2							
CO2	3						2							
CO3	3						2							
CO4	3						2							
CO5	3						2							

Unit No	Contents	Mapped COs
I	**INTRODUCTION TO ENVIRONMENT AND NATURAL RESOURCES:** Introduction to environment: Definition scope importance need for public awareness. Natural resources: Renewable and non renewable resources, natural resources and associated problems. Forest resources: Uses, Reasons for over-exploitation, deforestation effects case studies. Water resources: Use and over – utilization of surfaceand ground water, floods, drought, conflicts over water, dams- benefits and problems. Mineral resources: Uses, environmental effects of extracting and using mineral resources, case studies. Food resources: World food problems, Impacts of overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies. Energy resources: Growing energy needs, use of renewable and non renewable energy sources, case studies.	**CO1 CO2**
II	**ECOSYSTEMS AND BIODIVERSITY:** Structure components of ecosystem: Biotic and Abiotic components. Functional components of an ecosystem: Food chains, Food webs, Ecological pyramids, Energy flow in the ecosystem, Ecological succession. Biogeochemical cycle: Nitrogen, carbon, Phosphorus cycle. Biodiversity: Definition, Levels of biodiversity: genetic, species and ecosystem diversity. Bio-geographical classification of India, Values of biodiversity: consumptive use, productive use, social, ethical, aesthetic and optional values. India as a mega – diversity nation. Hot-spots of biodiversity. Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts. Conservation of biodiversity: In– situ and Ex-situ conservation of biodiversity.	**CO1 CO2**
III	**ENVIRONMENTAL POLLUTION AND CONTROL:** Environmental Pollution: Definition, causes, effects and control measures: Air Pollution, Water pollution, Soil pollution, Marine pollution, Thermal pollution, Nuclear hazards, Solid waste Management, e-waste, Pollution case studies.	**CO3**
IV	**SOCIAL ISSUES AND GLOBAL ENVIRONMENT PROBLEMS ANDEFFORTS:** From Unsustainable to Sustainable development. Urban problems related to energy. Water conservation, rain water harvesting, watershed management, Remote sensing and GIS methods. Environmental ethics: Issues and possible solutions. Green building concept, Environmental Impact Assessment Environmental Management Plan, Climate change: global warming, acid rain, ozone layer depletion.	**CO4 CO5**
V	**HUMAN POPULATION AND ENVIRONMENT LEGISLATION:** Population growth, Environment and human health. HIV/AIDS, Value Education. Women and Child Welfare. Role of Information Technology in Environment and human health. Environment Legislation. Air (Prevention and Control of Pollution) Act. Water (Prevention and Control of Pollution) Act. Wildlife Protection Act. Forest Conservation Act. Environmental Protection Act.	**CO4 CO5**

Learning Recourses
Text Books
1. Anubha Kaushik and C.P. Kaushik, *Text book of environmental studies*, New Age International Publisher (2014). 2. ErachBarucha, *Text book of environmental studies for undergraduates courses*, UGC, University Press (2005) 3. AninditaBasak, *Environmental Studies*. Pearson (2009)
Reference Books
1. D.K. Asthana and MeeraAsthana, A Text book of Environmental Studies, S. Chand (2010). 2. P.M Cherry Solid and Hazardous waste Management, CBS Publisher (2016). 3. Charles H. Ecclestion, Environmental Impact Assessment, CRC Press (2011).

PVP SIDDHARTHA INSTITUTE OF TECHNOLOGY, KANURU, VIJAYAWADA
(AUTONOMOUS)
INFORMATION TECHNOLOGY

COMMUNITY SERVICE PROJECT

Course Code	20IT3391	**Year**	II	**Semester**	I
Course Category	PC	**Branch**	IT	**Course Type**	Practical
Credits	4	**L-T-P**	0-0-0	**Prerequisites**	-
Continuous Internal Evaluation :	100	**Semester End Evaluation:**	-	**Total Marks:**	100

Course Outcomes		**Blooms Taxonomy Level**
Upon successful completion of the course, the student will be able to		
CO1	Analyze Community/Societal problems and identify its requirements.	**L4**
CO2	Design and document technical ideas, strategies and methodologies.	**L6**
CO3	Use tools, mobile apps and latest technologies that contribute to the development of the community service project.	**L3**
CO4	Role-Play as a member to present the community service project.	**L6**

Contribution of Course Outcomes towards achievement of Program Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	√	√	√	√		√	√						√	√
CO2		√	√	√				√		√			√	√
CO3					√								√	√
CO4									√		√	√	√	√

Contribution of Course Outcomes towards achievement of Program Outcomes & Strength of correlations (3:High, 2: Medium, 1:Low)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	3		3	3						3	3
CO2		3	3	3				3		3			3	3
CO3					3								3	3
CO4									3		3	3	3	3

PVP SIDDHARTHA INSTITUTE OF TECHNOLOGY, KANURU, VIJAYAWADA (AUTONOMOUS)
INFORMATION TECHNOLOGY

TRASFORM TECHNIQUES, NUMERICAL METHODS AND NUMBER THEORY

Course Code	20BS1404	**Year**	II	**Semester**	II
Course Category	BS	**Branch**	IT	**Course Type**	Theory
Credits	3	**L-T-P**	3-0-0	**Prerequisites**	-
Continuous Internal Evaluation	30	**Semester End Evaluation**	70	**Total Marks**	100

Course Outcomes		
Upon Successful completion of course, the student will be able to		
CO1	Understand the basic concepts of Transform Techniques, Numerical Methods and Number Theory	L2
CO2	Determine Laplace and inverse Laplace transforms of given function & Solving the linear differential Equations using Laplace transforms	L3
CO3	Apply different Numerical methods to solve the problems of numerical integration and ordinary differential equations	L3
CO4	Estimate the interpolated values, approximate roots and derivatives	L4

Contribution of Course Outcomes towards achievement of Program Outcomes Strength of correlations (3-High, 2: Medium, 1:Low)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1													1	
CO2	3								1	1			1	
CO3	3								1	1			1	
CO4		3											1	

Unit No	Contents	Mapped COs
I	**Laplace Transforms:** Definition of Laplace Transform, Transforms of elementary functions, properties of Laplace Transforms, Transforms of derivatives, Transforms of integrals, multiplication by t^n, division by t(All theorems/properties without proofs) **Application**: Evaluation of integrals.	**CO1, CO2**
II	**Inverse Laplace transforms:** Method of partial fractions, other methods of finding inverse Transform, convolution theorem.(All theorems/properties without proofs) **Application**: Solving differential equations using Laplace transforms.	**CO1, CO2**
III	**Solution of Algebraic and Transcendental Equations:** Bisection method, method of false position and Newton-Raphson's method. **Finite differences and Interpolation**: Relation between the operators, interpolation using Newton's forward and backward difference formulae. Interpolation with unequal intervals: Lagrange's formula. (All theorems/properties without proofs)	**CO1, CO3, CO4**
IV	**Numerical Solution of Ordinary differential equations:** Picard's Method, Taylor's Series Method, Euler's Method, modified Euler's Method, Runge-Kutta method of fourth order for solving first order equations. (All theorems/properties without proofs)	**CO1, CO3, CO4**
V	**Basic Concepts in Number Theory:** Divisibility and the Division Algorithm, The Euclidean Algorithm, Modular arithmetic, Prime numbers, Fermat's Theorem and Euler's Theorems, Testing for Primality, Chinese Remainder Theorem. (All theorems without proofs)	**CO1**

Learning Resources

Text Book(s)

1. B.S. Grewal, *Higher Engineering Mathematics,* Khanna Publishers, 44/e, 2019.
2. T.K.V.Iyenger, Krishna Gandhi and others, *Mathematical Methods* by S.Chand.
3. *Cryptography and Network Security- Principles and Practice,* William Stallings, Seventh Edition 2017, Pearson

Reference Book(s)

1. Erwin Kreyszig, *Advanced Engineering Mathematics*, 9/e, John Wiley & Sons, 2006.

e- Resources & other digital material

1. https://www.nptel.ac.in/courses/111/107/111107105/
2. https://nptel.ac.in/courses/106/105/106105162/
3. https://nptel.ac.in/courses/111/106/111106139/
4. IT Moodle

PVP SIDDHARTHA INSTITUTE OF TECHNOLOGY, KANURU, VIJAYAWADA

(AUTONOMOUS)
INFORMATION TECHNOLOGY

DATABASE MANAGEMENT SYSTEMS

Course Code	20IT3401	**Year**	II	**Semester**	II
Course Category	PC	**Branch**	IT	**Course Type**	Theory
Credits	3	**L-T-P**	3-0-0	**Prerequisites**	Data Structures
Continuous Internal Evaluation	30	**Semester End Evaluation**	70	**Total Marks**	100

Course Outcomes		
Upon Successful completion of course, the student will be able to		
CO1	Understand the basic concepts of database management systems	L2
CO2	Apply SQL as well as Relational Algebra to find solutions to a broad range of queries	L3
CO3	Apply various data models for database design	L3
CO4	Apply normalization techniques to improve database design	L3
CO5	Analyze a given database application scenario to use ER model for conceptual design of the database and make an effective report (Assignment)	L4

Contribution of Course Outcomes towards achievement of Program Outcomes & Strength of correlations (3:High, 2: Medium, 1:Low)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1													3	
CO2	3											3	3	
CO3	3										3	3	3	
CO4	3										3	3	3	
CO5		3							2	2	2		3	

Syllabus

Unit No	**Contents**	**Mapped CO**
I	**Introduction to Databases:** Characteristics of the Database Approach, Advantages of using the DBMS Approach, A Brief History of Database Applications. **Overview of Database Languages and Architectures:** Data Models, Schemas and Instances, Three-Schema Architecture and Data Independence, Database Languages and Interfaces, Database System environment, Centralized and Client-Server Architecture for DBMSs.	**CO1**

II	**Relational Model:** The Relational Model Concepts, Relational Model Constraints and Relational Database Schemas. **SQL:** Data Definition, Constraints, and Basic Queries and Updates, SQL Advanced Queries, Assertions, Triggers, and Views **Formal Relational Languages:** Relational Algebra: Unary Relational Operations: Select and Project, Relational Algebra Operations from Set Theory, Binary Relational Operations: Join and Division, Examples of Queries in Relational Algebra.	**CO1, CO2, CO5**
III	**Conceptual Data Modeling:** High-Level Conceptual Data Models for Database Design, A Sample Database Application, Entity Types, Entity Sets, Attributes and Keys, Relationship Types, Relationship Sets, Roles, and Structural Constraints, Weak Entity Types, Refining the ER Design, ER Diagrams, Naming Conventions and Design Issues, Relationship Types of Degree Higher Than Two Relational Database Design Using ER-to-Relational Mapping.	**CO1, CO3, CO5**
IV	**Database Design Theory:** Functional Dependencies, Normal forms based on Primary Keys, Second and Third Normal Forms, Boyce-Codd Normal Form, Multi valued Dependencies and Fourth Normal Form, Join Dependencies and Fifth Normal Form.	**CO1, CO4, CO5**
V	**Transaction Processing:** Introduction, Transaction and System Concepts, Desirable Properties of Transactions, Characterizing Schedules Based on Recoverability & Serializability, Transaction Support in SQL. **Introduction to Concurrency Control:** Two-Phase Locking Techniques: Types of Locks and System Lock Tables, Guaranteeing Serializability by Two-Phase Locking. Introduction to Recovery Protocols – Recovery Concepts, No-UNDO/REDO Recovery based on Deferred Update, Recovery Techniques based on Immediate Update, Shadow Paging.	**CO1**

Learning Recourses
Text Books
1. *DATABASE SYSTEMS Models, Languages, Design and Application Programming*, Sixth Edition, Ramez Elmasri, Shamkant B. Navathe, Pearson.
Reference Books
1. *Data base System Concepts*, Fifth Edition, Abraham Silberschatz, Henry F Korth, S. Sudarshan, McGraw Hill. 2. *Data base Management Systems*, Third Edition, Raghurama Krishnan, Johannes Gehrke, TMH. 3. *Introduction to Database Systems*, Eighth Edition , C.J.Date, Pearson
E-Recourses and other Digital Material
NPTEL VIDEO LECTURES

PVP SIDDHARTHA INSTITUTE OF TECHNOLOGY, KANURU, VIJAYAWADA

(AUTONOMOUS)

INFORMATION TECHNOLOGY

COMPUTER ORGANIZATION

Course Code	20IT3402	**Year**	II	**Semester**	II
Course Category	PC	**Branch**	IT	**Course Type**	Theory
Credits	3	**L-T-P**	3-0-0	**Prerequisites**	FDLD
Continuous Internal Evaluation	30	**Semester End Evaluation**	70	**Total Marks**	100

Course Outcomes		
Upon successful completion of the course, the student will be able to		
CO1	Understand the basic functional units of a computer system and its organization.	**L2**
CO2	Apply appropriate instructions for processing various types of computer operations.	**L3**
CO3	Apply various types of organizations on registers.	**L3**
CO4	Analyze memory hierarchy, I/O communication and pipelining.	**L4**

Contribution of Course Outcomes towards achievement of Program Outcomes & Strength of correlations (3:Substantial, 2: Moderate, 1:Slight)

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	3												3	
CO2	3												3	
CO3	3								2	2			3	
CO4		3											3	

Syllabus		
Unit No	**Contents**	**Mapped CO**
I	**Register Transfer and Micro-Operations:** Register Transfer Language, Register Transfer, memory Transfers, Bus construction with Multiplexers, Arithmetic Micro-operations, Logic Micro-operations, Shift Micro-operations, Arithmetic Logic Shift Unit.	**CO1,CO2**
II	**Basic Computer Organization:** Instruction codes, Computer Registers, Computer Instructions, Timing and Control, Instruction Cycle, Memory-Reference Instructions, Input-Output and Interrupt.	**CO1,CO2**
III	**Central Processing Unit:** General registers Organization, Stack Organization, Instruction Formats, Addressing Modes, Data Transfer and Manipulation, Program Control.	**CO1,CO2**
IV	**Computer Arithmetic:** Introduction, Addition and Subtraction, Booth Multiplication Algorithm. **Memory Organization:** Memory Hierarchy, Main Memory, Auxiliary memory, AssociativeMemory, Cache Memory, Virtual Memory.	**CO1,CO3**
V	**Input-Output Organization:** Peripheral Devices, Input-output Interface, Asynchronous Data Transfer, Priority Interrupt, Direct Memory Access (DMA), Input-Output Processor. **Pipeline and Parallel Processing:** Parallel processing, Pipelining, Arithmetic pipeline, Instruction pipeline.	**CO1,CO4**

Learning Resources

Text Books

1. *Computer System Architecture*, Morris M. Mano, Third Edition, 1992, Pearson.

References

1. *Computer Organization and Architecture*, William Stallings, Eighth Edition, 2010, PHI.
2. *Computer Organization*, Carl Hamachar, Vranesic, 2002, McGrawHill.

e- Resources and other Digital Material

1. https://nptel.ac.in/courses/106/106/106106092/

PVP SIDDHARTHA INSTITUTE OF TECHNOLOGY, KANURU, VIJAYAWADA
(AUTONOMOUS)
INFORMATION TECHNOLOGY
Design and Analysis of Algorithms

(Common to CSE & IT)

Course Code	20IT3403	**Year**	II	**Semester**	II
Course Category	PC	**Branch**	IT	**Course Type**	Theory
Credits	3	**L-T-P**	3-0-0	**Prerequisites**	Discrete Mathematical Structures and Data Structures
Continuous Internal Evaluation	30	**Semester End Evaluation**	70	**Total Marks**	100

Course Outcomes		
Upon successful completion of the course, the student will be able to		
CO1	Understand the fundamental concepts of algorithm analysis and design techniques.	**L2**
CO2	Apply various algorithm design techniques for solving problems	**L3**
CO3	Analyze the performance of given problem using different algorithm techniques.	**L4**
CO4	Analyze the given problem and provide the feasible solution.	**L4**

Contribution of Course Outcomes towards achievement of Program Outcomes & Strength of correlations (3:Substantial, 2: Moderate, 1:Slight)

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	3												3	3
CO2	3								2	2		3	3	3
CO3		3							1	1		3	3	3
CO4		3							1	1		3	3	3

Syllabus		
Unit No	**Contents**	**Mapped CO**
I	**Introduction:** Notion of Algorithm, Fundamentals of Algorithmic Problem Solving. Fundamentals of the Analysis of Algorithm Efficiency: Analysis framework and Asymptotic Notations and Basic Efficiency Classes, Amortized Analysis. Introduction to Brute Force Technique, Exhaustive Search.	**CO1,CO2, CO3**
II	**Divide and Conquer:** Introduction, Merge sort, Quick sort, Binary Search, Finding Maximum andMinimum, Strassen's Matrix Multiplication.	**CO1,CO2, CO3,CO4**
III	**The Greedy Method:** Introduction, Huffman Trees and codes, Minimum Coin Change problem, Knapsack problem, Job sequencing with deadlines, Minimum CostSpanning Trees, Single Source Shortest paths.	**CO1,CO2, CO3,CO4**
IV	**Dynamic Programming:** Introduction, 0/1 Knapsack problem, All pairs shortest paths, OptimalBinary search trees, Travelling salesman problem.	**CO1,CO2, CO3,CO4**
V	**Back Tracking:** Introduction, n-Queens problem, Sum of subsets, Hamiltonian cycle. **Branch and Bound:** Introduction, Assignment problem, Travelling Salesman problem. **Introduction to Complexity classes:** P and NP Problems, NP-Complete Problems.	**CO1,CO2, CO3,CO4**

Learning Resources

Text Books

1. *Introduction to the Design & Analysis of Algorithms*, Anany Levitin, Third Edition, 2011, Pearson Education.
2. *Data Structures and Algorithm Analysis in C*, Mark Allen Weiss, 2002, Pearson.
3. *Algorithm Design Techniques*, Narasimha Karumanchi, CareerMonk Publications, 2018.

References

1. *Introduction to Algorithms*, Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, Clifford Stein, Third Edition, 2012, MIT Press.
2. *Fundamentals of computer algorithms*,Ellis Horowitz, Sartaj Sahni, S. Rajasekharan, Second Edition, 2008, Universities Press.

e-Resources and other Digital Material

1. https://nptel.ac.in/courses/106/106/106106131/
2. https://www.cmi.ac.in/~madhavan/
3. https://www.coursera.org/lecture/analysis-of-algorithms/resources-jMWPy
4. https://www.geeksforgeeks.org/fundamentals-of-algorithms/

PVP SIDDHARTHA INSTITUTE OF TECHNOLOGY, KANURU, VIJAYAWADA (AUTONOMOUS)
INFORMATION TECHNOLOGY

PROGRAMMING WITH JAVA

Course Code	20IT3404	**Year**	II	**Semester**	II
Course Category	PC	**Branch**	IT	**Course Type**	Theory
Credits	3	**L-T-P**	3-0-0	**Prerequisites**	Programming for Problem Solving and OOP Through C++
Continuous Internal Evaluation	30	**Semester End Evaluation**	70	**Total Marks**	100

Course Outcomes		
Upon successful completion of the course, the student will be able to		
CO1	Illustrate the need, principles and fundamental concepts in JAVA.	L2
CO2	Apply the knowledge of Object Oriented Programming principles to develop applications.	L3
CO3	Analyze the concepts of Packages, Multithreading and Exception handling to develop efficient and error free applications.	L4
CO4	Develop GUI based applications using JAVA constructs.	L3

Contribution of Course Outcomes towards achievement of Program Outcomes & Strength of correlations (3:Substantial, 2: Moderate, 1:Slight)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3												3	3
CO2	3		3										3	3
CO3		3											3	3
CO4			3		3								3	3

Syllabus		
Unit No	**Contents**	**Mapped CO**
I	**Java Evolution & Environment:** History and Evaluation of Java, Overview of Java language, Java's magic code: Byte code, Java Buzzwords, Three OOP principles, simple program. **Java programming environment**: Data types, variables and Arrays, Operators, control statements. **Classes, Objects and Methods:** Introduction, defining a class, declaring objects, assigning object reference variables, introducing methods, accessing class members, returning a value, constructors, parameterized constructors, this keyword, garbage collection, overloading constructors and methods, recursion, understanding static, introducing final, Using command line arguments.	**CO1, CO2**
II	**Strings**: String, String Buffer and String Tokenizer classes. **Basic I/O:** Data Input Stream, Data Output Stream, Buffered Reader, Input Stream Reader, Scanner classes. **Inheritance:** Basics, Using super, creating multilevel hierarchy, order of constructor execution, method overriding, dynamic method dispatch, applying method overridden, Abstract classes, Using final with inheritance, The Object class. **Interfaces:** Introduction, defining an interface, implementing interfaces. Accessing interfaces through interface references, nested interfaces, variables in interfaces, interfaces can be extended.	**CO1, CO2**
III	**Package:** Defining a package, CLASSPATH, Packages and member access, importing packages. **Exception Handling:** Fundamentals, types, uncaught exceptions, using try and catch, multiple catch clauses, nested try statement, throw, throws, finally, built- in exceptions, creating your own exception subclasses. **Multi Threaded programming:** Thread model, Creating a Thread: implementing runnable, extending Thread, creating multiple threads, using isAlive() and join(), Thread Priorities, synchronization.	**CO1, CO2, CO3**
IV	**Event handling:** Event handling mechanisms, delegation event model, Event classes, sources of events, event listener interfaces, Handling mouse and keyboard events, adapter classes, inner class. **Graphics Programming with AWT**: Introduction, abstract window toolkit classes, Window fundamentals. **AWT controls:** AWT Control fundamentals - labels, buttons, check boxes, choice lists, lists, scroll bars, text field, text area, layout managers	**CO1, CO2, CO4**
V	**Swing:** Origins, key features, MVC connection, Components and Containers **Exploring Swing**- JLabel, JTextField, JButton, JCheckBox, JRadioButton,JList, JComboBox. **Applets:** Two types of Applets, The Applet Class, Applet Architecture, An Applet Skelton, Swing Applets.	**CO1, CO2, CO4**

Learning Resources

Text Books

1. The Java Complete Reference, Herbert Scheldt, 10/e, TMH Publications, 2018.

References

1. E. Balagurusamy, Programming with JAVA, 2/e, TMH Publications, 2014.
2. Core Java: An Integrated Approach, New: Includes All Versions up-to Java 8, by R. Nageswara Rao, Dream-Tech Publishers.
3. Kathy Sierra, Head First Java, 2/e, Shroff Publishers, 2012.

E-Recourses and other Digital Material

1. https://www.w3schools.com/java/java_intro.asp
2. https://www.tutorialspoint.com/java/index.htm

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(AUTONOMOUS)
INFORMATION TECHNOLOGY

DATABASE MANAGEMENT STSYEMS LAB

Course Code	20IT3451	**Year**	II	**Semester**	II
Course Category	PC Lab	**Branch**	IT	**Course Type**	Lab
Credits	1.5	**L-T-P**	0-0-3	**Prerequisites**	-
Continuous Internal Evaluation	15	**Semester End Evaluation**	35	**Total Marks**	50

Course Outcomes		
Upon Successful completion of course, the student will be able to		
CO1	Apply various SQL constructs for data definition, data manipulation and querying	L3
CO2	Implement experiments by using modern tools like MYSQL, Oracle	L2
CO3	Develop an effective report based on various constructs implemented.	L2
CO4	Apply technical knowledge for a given problem and express with an effective oral communication.	L3
CO5	Analyze solutions using database concepts for various applications	L4

Contribution of Course Outcomes towards achievement of Program Outcomes & Strength of correlations (H:High, M: Medium, L:Low)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2											2		
CO2					3				3				3	
CO3										3				
CO4	1									1			1	
CO5		3											3	3

Exercise No	Course Content	Mapped CO
1	Introduction to MySQL Workbench. How to use MySql Workbench to run SQL Statements.	CO1-CO5
2	Examples on i)DDL Commands: CREATE , ALTER, DROP and TRUNCATE a Table ii) Implementation of Constraints PRIMARY KEY, FOREIGN KEY, CHECK, NOT NULL, UNIQUE.	CO1-CO5
3	Examples on i) DML Commands. INSERT, UPDATE and DELETE ii) DCL Commands: COMMIT , ROLLBACK and SAVEPOINT.	CO1-CO5
4	Examples on retrieving data from a single table using i)SELECT statement ii) SELECT statement with where clause(Comparison Operators, AND, OR, NOT, IN, BETWEEN,LIKE) iii) ORDER BY clause(sort by column name) iv) LIMIT clause	CO1-CO5
5	Examples on Functions in MySQL: String, Numeric,Date, Time and Other Functions.	CO1-CO5
6	Examples on Summary Queries: Queries using Aggregate functions, GROUP By and Having Clauses, ROLLUP Operator.	CO1-CO5
7	Examples on Inner join, outer join using USING, NATURAL Keywords	CO1-CO5
8	Examples on SUB/SUMMARY Queries Using IN, ANY, SOME, ALL , EXISTS and NOT EXISTS functions	CO1-CO5
9	Examples on i)Creating INDEXES and VIEWS ii) INSERT,DELETE and DROP on VIEWS	CO1-CO5
10	Examples on i)Create and Call STORED PROCEDURE (IN,OUT,INOUT Parameters) , Drop a STORED PROCEDURE. ii) Create,call and Drop a FUNCTION. iii) Create and Drop a TRIGGER	CO1-CO5
11	Case Study using real world database applications	CO1-CO5

Learning Resources
Text Books
Murac's *MySQL* by Joel Murach, Shroff Publishers & Distributors Pvt.Ltd, June 2012.

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INFORMATION TECHNOLOGY

DESIGN AND ANALYSIS OF ALGORITHMS LAB

Course Code	20IT3452	**Year**	II	**Semester**	II
Course Category	PC Lab	**Branch**	IT	**Course Type**	Lab
Credits	1.5	**L-T-P**	0-0-3	**Prerequisites**	Data Structures , Programming for Problem Solving
Continuous Internal Evaluation	15	**Semester End Evaluation**	35	**Total Marks**	50

Course Outcomes		
Upon successful completion of the course, the student will be able to		
CO1	Apply different design techniques for solving problems.	**L3**
CO2	Implement programs as an individual on different IDEs/ online platforms.	**L3**
CO3	Develop an effective report based on various programs implemented.	**L3**
CO4	Apply technical knowledge for a given problem and express with an effective oral communication.	**L3**
CO5	Analyze outputs using given constraints/test cases.	**L4**

Contribution of Course Outcomes towards achievement of Program Outcomes & Strength of correlations (3:Substantial, 2: Moderate, 1:Slight)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO1	PSO2
CO1	2											2	2	2
CO2					3				3					
CO3										3				
CO4		1								1				
CO5		3												

Syllabus		
Expt No	**Contents**	**Mapped CO**
1.	Develop and implement an algorithm using Divide and Conquer strategy for a given set of problems.	**CO1-CO5**
2.	Make use of Greedy method to implement a solution for a given problem.	**CO1-CO5**
3.	Develop and implement an efficient solution using Dynamic Programming.	**CO1-CO5**
4.	Use Backtracking design technique to implement a solution fora given problem.	**CO1-CO5**
5.	Develop and implement an algorithm using Branch and Bound technique for solving a given problem.	**CO1-CO5**
6.	Case Study-1: Apply the most appropriate design technique to develop and implement an efficient solution for a given problem.	**CO1-CO5**
7.	Case Study-2: Develop and implement an optimal solution for a givenproblem by applying a suitable design technique.	**CO1-CO5**

Learning Resources

Text Books

1. *Introduction to the Design & Analysis of Algorithms*, Anany Levitin, Third Edition, 2011, Pearson Education.
2. *Data Structures and Algorithm Analysis in C*, Mark Allen Weiss, 2002, Pearson.
3. *Algorithm Design Techniques*, Narasimha Karumanchi, CareerMonk Publications, 2018.

e- Resources & other digital material

1. https://www.cs.usfca.edu/~galles/visualization/Algorithms.html
2. http://littlesvr.ca/dsa-html5-animations/sorting.php
3. https://www.youtube.com/watch?v=AfYqN3fGapc

PVP SIDDHARTHA INSTITUTE OF TECHNOLOGY, KANURU, VIJAYAWADA (AUTONOMOUS)
INFORMATION TECHNOLOGY

PROGRAMMING WITH JAVA LAB

Course Code	20IT3453	**Year**	II	**Semester**	II
Course Category	PC Lab	**Branch**	IT	**Course Type**	Practical
Credits	1.5	**L-T-P**	0-0-3	**Prerequisites**	C Language
Continuous Internal Evaluation	15	**Semester End Evaluation**	35	**Total Marks**	50

Course Outcomes		**Blooms Levels**
Upon Successful completion of course, the student will be able to		
CO1	Implement the programs by using basics and fundamental concepts of JAVA.	L3
CO2	Apply the knowledge of OOP principles to develop applications	L3
CO3	Analyze the given Java program to identify bugs and write correct code.	L4
CO4	Use APIs (Application Programming Interfaces) to develop applications in Java.	L3

Contribution of Course Outcomes towards achievement of Program Outcomes & Strength of correlations (3:Substantial, 2: Moderate, 1:Slight)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3				3								3	3
CO2	3				3								3	3
CO3		3			3								3	3
CO4	3				3								3	3

	EXERCISES	Mapped CO
1	a. Java Program to print largest of three numbers b. Java program to calculate sum of all the numbers divisible by 3 from 1 to n. Print the sum. c. Write a Java program to calculate the sum of first "n" even integer numbers and "n" odd integer numbers excluding 0; d. Write a Java program to read the size of an array from keyboard. You have to initialize the integer array and insert the elements into it. You have to find the minimum number in that array and print the same. e. Write a Java program to find the average of all odd numbers present in the array and print the same.	CO1-CO4
2	Implement the programs by using the concepts of a. returning value from a method, b. constructors c. overloading methods, d. overloading constructors e. passing objects as a parameters.	CO1-CO4
3	Develop applications using the concepts of a. String class and its methods b. String Buffer and its methods c. String Tokenizer and its methods	CO1-C04
4	Implement the programs by using the concepts of a. Method overriding, b. dynamic method dispatch c. Abstract class, d. Using final in inheritance	CO1-CO4
5	Implement the programs by using the concepts of a. Implementing interfaces, b. Nested interfaces c. Interface references, d. Extending interfaces	CO1-CO4
6	A. Create a user defined package and demonstrate different ways of importing packages. B. Implement the programs by using the concepts of a. multiple catch clauses, b. finally c. Creating user defined exceptions	CO1-CO4
7	Implement the programs using a. Creating threads (two –ways), b. Creation of multiple threads c. Thread synchronization	CO1-CO4
8	Develop applications that demonstrate by using a. Key board event handling, b. Mouse event handling	CO1-CO4
9	Develop applications by using AWT controls a. Buttons b. TextField and TextArea c. GridLayoutManager	CO1-CO4
10	Develop applications by using Swing components a. JLabel b. JTextField c. JButton d. JComboBox.	CO1-CO4

Learning Resources

Text Books

The Java Complete Reference, Herbert Scheldt, 10/e, TMH Publications, 2018.

References

1. E. Balagurusamy, *Programming with JAVA*, 6/e, TMH Publications, 2014.
2. *Core Java: An Integrated Approach*, New: Includes All Versions up-to Java 8, by R. Nageswara Rao, Dream-Tech Publishers.
3. Kathy Sierra, *Head First Java*, 3/e, O'Reilly Media, 2021.

E-Recourses and other Digital Material

1. https://www.w3schools.com/java/java_intro.asp
2. https://www.tutorialspoint.com/java/index.htm

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INFORMATION TECHNOLOGY

PYTHON PROGRAMMING

Course Code	20SO8455	**Year**	II	**Semester**	II
Course Category	SC	**Branch**	IT	**Course Type**	Practical
Credits	2	**L-T-P**	1-0-2	**Prerequisites**	Fundamentals of Computers
Continuous Internal Evaluation	-	**Semester End Evaluation**	50	**Total Marks**	50

Course Outcomes		**Blooms Taxonomy Level**
Upon Successful completion of course, the student will be able to		
CO1	Understand the basic concepts of Python Programming.	L2
CO2	Apply functions, modules and string handling in Python to solve problems.	L3
CO3	Analyze and choose appropriate data structure for solving problems.	L3
CO4	Analyze data using computation and visualization libraries.	L3

ContributionofCourseOutcomestowardsachievementofProgramOutcomes&Strengthof correlations(H:High,M:Medium,L:Low)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	2	1		2						1		3	2
CO2	2	2	1		2						1		1	2
CO3	3	2	2		2						1		2	3
CO4	3	3	2		2						2		2	3

Unit No	Contents	Mapped COs
1	**Introduction to Python:** Features of Python, Writing and Executing First Python Program, Literal Constants, Variables and Identifiers, Reserved Words, Data Types, Input Operation, Operators and Expressions, Operations on Strings, Type Conversion, Conditional statements and iterative statements.	CO1
2	**Functions and Strings in python Functions:** Introduction, Built-in Math Functions,User Defined Functions: Function Call, Variable Scope and Lifetime, The return statement, Lambda Functions, Modules and Packages in python. **Strings:** Introduction, Built-in String Functions, Slice Operation, Comparing Strings, Iterating String, Regular Expressions.	CO1, CO2
3	**Data Structures** **Lists:** Accessing values in lists, Nested Lists, Basic List Operations. **Tuples:** Creating Tuple, Accessing values in a tuple, Basic Tuple Operations. **Dictionaries:** Creating and Accessing Dictionaries, Built-in Dictionary functions, List Vs Tuple Vs Dictionary. **Sets**: Creating a Set and set operations	CO1, CO3
4	**Python data computation libraries** **Pandas:** Dataframe, Data manipulation, reshaping and pivoting of dataset, merging and joining of data sets, data slicing, subsetting. **Numpy:** Creating arrays, array indexing, array slicing, array reshape, array iterating, array join, array split, array search, array sort, array filter.	CO1, CO4
5	**Python data computation libraries** **SciPy:** SciPy vs Numpy, Introduction to SciPy subpackages. **Python data visualization libraries** **Matplotlib:** Scatter plot, line chart, Histogram, Bar chart. **Seaborn:** Scatter plot, line chart, Histogram, Bar chart.	CO1, CO4

Course Content - Practical

Expt. No	Contents	Mapped CO
1	Python programs on usage of operators.	**CO1**
2	Python Programs to demonstrate decision making and branching (Selection)	**CO1**
3	Python programs to demonstrate iterative statements.	**CO1**
4	Python programs to demonstrate functions	**CO2**
5	Python program to demonstrate modules and packages	**CO2**
6	Python programs to perform operations on strings, regular expressions with built – in functions	**CO2**
7	Python programs to apply List, Tuple data structures.	**CO3**
8	Python programs to apply Set, Map data structures.	**CO3**
9	Installing, importing accessing and computations on a dataset using Pandas library	**CO4**
10	Installing, importing accessing and computations on a dataset using Numpy library	**CO4**
11	Installing, importing and visualization of dataset using Pandas and Matplotlib libraries.	**CO4**
12	Installing, importing and visualization of dataset using Seaborn library.	**CO4**

Learning Resources
Text Books
1. *Python Programming using Problem Solving Approach* by ReemaThareja, 2017, OXFORD University Press 2. *Python Programming: Problem Solving, Packages and Libraries* by Anurag Gupta and G.P. Biswas,2020, McGraw Hill
References
1. *Core Python programming* by R. NageswaraRao, 2018, Dreamtech press. 2. *Programming with python* by T R Padmanabhan, 2017, Springer.
E-Recourses and other Digital Material
1. https://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-0001-introduction-to-computer-science-and-programming-in-python-fall-2016/lecture-videos/ 2. https://www.python.org/ 3. http://www.ict.ru.ac.za/Resources/cspw/thinkcspy3/thinkcspy3.pdf

UNIVERSAL HUMAN VALUES

Course Code	20MC1401	**Year**	II	**Semester**	II
Course Category	MC	**Branch**	IT	**Course Type**	Theory
Credits	0	**L-T-P**	2-0-0	**Prerequisites**	-
Continuous Internal Evaluation	30	**Semester End Evaluation**	70	**Total Marks**	100

Course Outcomes		**Blooms Taxonomy Level**
Upon successful completion of the course, the student will be able to		
CO1	Describe more aware of themselves, and their surroundings (family, society, nature)	**L2**
CO2	Illustrate more responsibility in life, and in handling problems with sustainable solutions, while keeping human relationships and human nature in mind.	**L2**
CO3	Show better critical ability	**L3**
CO4	Exhibit sensitivity to their commitment towards what they have understood (human values, human relationship and human society)	**L3**
CO5	Apply what they have learnt to their own self in different day-to-day settings in real life, at least a beginning would be made in this direction.	**L3**

Contribution of Course Outcomes towards achievement of Program Outcomes & Strength of correlations (H:High, M:Medium, L:Low)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1						3		3						3
CO2						3		3						3
CO3						3		3						3
CO4						3		3						3
CO5						3		3						3

Syllabus		
Unit No	**Contents**	**Mapped CO**
I	**Introduction - Need, Basic Guidelines, Content and Process for Value Education:** pose and motivation for the course, recapitulation from Universal Human Values-I, Self-Exploration–what is it? - Its content and process; 'Natural Acceptance' and Experiential Validation- as the process for self-exploration, Continuous Happiness and Prosperity- A look at basic Human Aspirations, Right understanding, Relationship and Physical Facility- the basic requirements for fulfilment of aspirations of every human being with their correct priority, Understanding Happiness and Prosperity correctly- A critical appraisal of the current scenario, Method to fulfil the above human aspirations: understanding and living in harmony at various levels.	**CO1**
II	**Understanding Harmony in the Human Being - Harmony in Myself!** Understanding human being as a co-existence of the sentient 'I' and the material 'Body', Understanding the needs of Self ('I') and 'Body' - happiness and physical facility, Understanding the Body as an instrumentof 'I' (I being the doer, seer and enjoyer),Understanding the characteristics and activities of 'I' and harmony in 'I', Understanding the harmony of I with the Body: Sanyam and Health; correct appraisal of Physical needs, meaning of Prosperity in detail, Programs to ensure Sanyam and Health	**CO2**
III	**Understanding Harmony in the Family and Society- Harmony in Human-Human Relationship:** Understanding values in human-human relationship; meaning of Justice (nine universal values in relationships) and program for its fulfilment to ensure mutual happiness; Trust and Respect as the foundational values of relationship. Understanding the meaning of Trust; Difference between intention and competence, Understanding the meaning of Respect, Difference between respect and differentiation; the other salient values in relationship, Understanding the harmony in the society (society being an extension of family): Resolution, Prosperity, fearlessness (trust) and co- existence as comprehensive Human Goals, Visualizing a universal harmonious order in society- Undivided Society, Universal Order- from family to world family	**CO3**
IV	**Understanding Harmony in the Nature and Existence - Whole existence as Coexistence:** Understanding the harmony in the Nature, Interconnectedness and mutual fulfilment among the four orders of nature- recyclability and self regulation in nature, Understanding Existence as Co-existence of mutually interacting units in all- pervasive space, Holistic perception of harmony at all levels of existence	**CO4**
V	**Implications of the above Holistic Understanding of Harmony onProfessional Ethics:** Natural acceptance of human values, Definitiveness of Ethical Human Conduct, Basis for Humanistic Education, Humanistic Constitution and Humanistic Universal Order, Competence in professional ethics: Ability to utilize the professional competence for augmenting universal human order b. Ability to identify the scope and characteristics of people friendly and eco-friendly production systems, c. Ability to identify and develop appropriate technologies and management patterns for above production systems. Case studies of typical holistic technologies, management models and production systems, Strategy for transition from the present state to Universal Human Order: a. At the level of individual: as socially and ecologically responsible engineers, technologists and managers b. At the level of society: as mutually enriching institutions and Organizations	**CO5**

Learning Resources
Text Books
1. *Human Values and Professional Ethics* by R R Gaur, R Sangal, G P Bagaria, Excel Books,New Delhi, 2010
References
1. *JeevanVidya: EkParichaya* by ANagaraj, JeevanVidyaPrakashan, Amarkantak, 1999. 2. *HumanValues* by A.N.Tripathi,NewAgeIntl.Publishers,NewDelhi,2004. 3. *The Story of Stuff*(Book). 4. *TheStoryofMyExperimentswithTruth* – byMohandas Karamchand Gandhi

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INFORMATION TECHNOLOGY

OPERATING SYSTEMS (Minor)

Course Code	20IT5401	**Year**	II	**Semester**	II
Course Category	Minor	**Branch**	IT	**Course Type**	Theory
Credits	4	**L-T-P**	4-0-0	**Prerequisites**	-
Continuous Internal Evaluation :	30	**Semester End Evaluation:**	70	**Total Marks:**	100

Course Outcomes		**Blooms Level**
Upon successful completion of the course, the student will be able to:		
CO1	Understand the structure and functionalities of operating systems.	L2
CO2	Apply various concepts to solve problems related to process synchronization, deadlocks and make an effective report.	L3
CO3	Apply different algorithms of CPU scheduling, Page replacement and disk scheduling.	L3
CO4	Analyze process, memory and storage management strategies.	L4

Contribution of Course Outcomes towards achievement of Program Outcomes & Strength of correlations (3:High, 2: Medium, 1:Low)

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	**3**												**3**	
CO2			**3**											
CO3		**3**											**3**	
CO4		**3**												

SYLLABUS		
Unit No	**Contents**	**Mapped CO**
UNIT-1	**Overview: Introduction**: What Operating Systems Do, Computer-System Organization, Computer-System Architecture, Operating-System Structure, Operating-System Operations **Operating System Structures:** Operating-System Services, User and Operating-System Interface, System Calls, Types of System Calls.	CO1
UNIT-2	**Process Management:** Process Concept, Process Scheduling, Operations on Processes, Interprocess Communication. **Threads:** Overview, Multicore Programming, Multithreading Models. **Process Scheduling:** Basic Concepts, Scheduling Criteria, Scheduling Algorithms (First-Come, First-Served Scheduling, Shortest-Job-First Scheduling, Priority Scheduling, Round-Robin Scheduling.)	CO1,CO3,CO4
UNIT-3	**Process Synchronization:** Background, The Critical-Section Problem, Peterson's Solution, Synchronization Hardware, Mutex Locks, Semaphores, Classic Problems of Synchronization. **Deadlocks:** System Model, Deadlock Characterization, Methods for Handling Deadlocks, Deadlock Prevention, Deadlock Avoidance, Deadlock Detection, Recovery from Deadlock.	CO1, CO2
UNIT-4	**Memory Management:** **Main Memory:** Background, Swapping, Contiguous Memory Allocation, Segmentation, Paging, Structure of the Page Table **Virtual Memory:** Background, Demand Paging, Copy-on-Write, Page Replacement, Basic Page Replacement, FIFO Page Replacement, Optimal Page Replacement, LRU Page Replacement, LRU-Approximation Page Replacement.	CO1, CO3,CO4
UNIT-5	**Storage Management:** **File–System Interface:** File Concept, Access Methods, Directory and Disk Structure. **File–System Implementation:** File-System Structure, File-System Implementation, Directory Implementation, Allocation Methods. **Mass-Storage Structure**: Overview of Mass-Storage Structure, Disk Structure, Disk Attachment, Disk Scheduling, FCFS Scheduling, SSTF Scheduling, SCAN Scheduling, C-SCAN Scheduling, LOOK Scheduling, Selection of a Disk-Scheduling Algorithm.	CO1, CO3,CO4

Learning Resources	
Text book:	
1	Operating System Concepts, Abraham Silberchatz, Peter Baer Galvin, Greg Gagne, Ninth Edition, 2016, Wiley India.
References:	
1	Operating Systems - Internal and Design Principles, William Stallings, Ninth Edition, 2018, Pearson.
2	Operating Systems - Harvey M.Deitel, Paul J Deitel and David R.Choffnes , Third Edition, 2019, Pearson.
3	Operating Systems - A Concept based Approach- D.M. Dhamdhere, Second Edition, 2010, McGraw Hill.
e-Resources and other Digital Material:	
1	https://www.youtube.com/watch?v=z3Nw5o9dS7Q&list=PLsylUObW5M3CAGT6OdubyH6FztKfJCcFB
2	http://www.youtube.com/watch?v=MaA0vFKtew&list=PL88oxI15Wi4Kw1aEY2bC5l_4pouojjtd4

PVP SIDDHARTHA INSTITUTE OF TECHNOLOGY, KANURU, VIJAYAWADA

(AUTONOMOUS)
INFORMATION TECHNOLOGY

CYBER SECURITY AND ETHICAL HACKING
(Honors)

Course Code	20IT6401	**Year**	II	**Semester**	II
Course Category	HONORS	**Branch**	IT	**Course Type**	Theory
Credits	4	**L-T-P**	4-0-0	**Prerequisites**	
Continuous Internal Evaluation :	30	**Semester End Evaluation**	70	**Total Marks:**	100

Course Outcomes		
Upon Successful completion of course, the student will be able to		
CO1	Understand the basics of cyber security and Ethical Hacking	L2
CO2	Illustrate diverse cyber offences	L3
CO3	Identify various methods and tools used in Cyber Crime.	L2
CO4	Identify different issues and techniques in hacking	L3

Contribution of Course Outcomes towards achievement of Program Outcomes & Strength of correlations (3:High, 2: Medium, 1:Low)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3												2	2
CO2	3												2	2
CO3		3											2	2
CO4	3					3		3					2	2

Syllabus		
Unit No	**Contents**	**Mapped CO**
I	**Introduction to Cybercrime**: Introduction, Cybercrime, and Information Security, Who are Cybercriminals, Classifications of Cybercrimes, The legal Perspectives and Indian Perspective, Cybercrime and the Indian ITA 2000, A Global Perspective on Cybercrimes.	**CO1**
II	**Cyber Offenses**: How Criminals Plan Them: Introduction, How Criminals plan the Attacks, Social Engineering, Cyber stalking, Cyber cafe and Cybercrimes, Botnets(The Fuel for Cybercrime), Attack Vector, and Cloud Computing.	**CO1,CO2**
III	**Tools and Methods Used in Cybercrime**: Introduction, Proxy Servers and Anonymizers, Phishing, Password Cracking, Key loggers and Spywares, Virus and Worms, Trojan Horse and Backdoors, Steganography, DoS and DDoS attacks, SQL Injection, Buffer Overflow	**CO1,CO3**
IV	**Introduction to Ethical Hacking, Ethics, and Legality**: Defining Ethical Hacking, How to Be Ethical, Keeping It Legal, Reconnaissance, Information-Gathering Methodology	**CO1,CO4**
V	**System Hacking**: The Simplest Way to Get a Password, Types of Passwords, Cracking a Password, Understanding Keyloggers and Other Spyware Technologies Trojans and Backdoors: Overt and Covert Channels , Types of Trojans, Viruses and Worms : Types of Viruses, Virus Detection Methods	**CO1,CO4**

Learning Resources
Text Books
1. Cyber Security: Understanding Cyber Crimes, Computer Forensics and Legal Prespectives, Nina Godbole and Sunil Belapure, First edition, 2011, Wiley INDIA 2. Certified ethical hacker study guide by Kimberly Graves,First Edition
References
1. James Graham, Richard Howard and Ryan Otson, Cyber Security Essentials, First edition, 2011, CRC Press. 2. Chwan-Hwa(John) Wu,J.David Irwin, Introduction to Cyber Security, First edition, 2013, CRC Press T&F Group.
E-Recourses and other Digital Material
1. https://onlinecourses.nptel.ac.in/noc22_cs13/preview 2. http://eprints.binadarma.ac.id/1000/1/KEAMANAN%20SISTEM%20INFORMASI%20MATERI%201.pdf

PVP SIDDHARTHA INSTITUTE OF TECHNOLOGY, KANURU, VIJAYAWADA(AUTONOMOUS)
INFORMATION TECHNOLOGY

OBJECT ORIENTED MODELLING AND DESIGN
(Honors)

Course Code	20IT6401	**Year**	II	**Semester**	II
Course Category	HONORS	**Branch**	IT	**Course Type**	Theory
Credits	4	**L-T-P**	4-0-0	**Prerequisites**	Object Oriented Programming
Continuous Internal Evaluation :	30	**Semester End Evaluation:**	70	**Total Marks:**	100

Course Outcomes		
Upon Successful completion of course, the student will be able to		
CO1	Understand the basic concepts in modeling ,analysis and design of a system using Unified modeling language	L2
CO2	Identify different modeling elements for a given application using Unified Modeling language.	L3
CO3	Identify different techniques to analyze requirements of a given system using Unified Modeling language.	L3
CO4	Design or Model a system for any given application	L3

Contribution of Course Outcomes towards achievement of Program Outcomes & Strength of correlations (3:High, 2: Medium, 1:Low)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3												3	3
CO2		3											3	3
CO3		3											3	3
CO4			3										3	3

Syllabus		
Unit No	**Contents**	**Mapped CO**
I	**Introduction, Modeling Concepts, Class Modeling**: What is Object Orientation? What is OO development? OO themes, Evidence for usefulness of OO development, Modeling as Design Technique: Modeling, Abstraction, The three models. Class Modeling: Object and class concepts, Link and associations concepts, Generalization and inheritance, A sample class model, Navigation of class models.	**CO1,CO2**
II	**Advanced Class Modeling, State Modeling:** Advanced object and class concepts, Association ends, N-ary associations, Aggregation, Abstract classes; Multiple inheritance, Metadata, Reification, Constraints, Derived data, Packages, Practical tips. State Modeling: Events, States, Transitions and Conditions, State diagrams, State diagram behaviour.	**CO1,CO2**
III	**Advanced State Modeling, Interaction Modeling:** Advanced State Modeling: Nested state diagrams, Nested states, Signal generalization, A sample state model; Relation of class and state models. Interaction Modeling: Use case models, Sequence models, Activity models.	**CO1,CO2**
IV	**Process Overview, System Conception, Domain Analysis, Application Analysis**: Process Overview: Development stages, Development life cycle. System Conception: Devising a system concept, Preparing a problem statement. Domain Analysis: Overview of analysis, Domain class model; Domain state model, Domain interaction model. Application Analysis: Application interaction model, Application class model, Application state model	**CO1,CO3**
V	**System Design, Implementation Modeling:** Overview of system design, Breaking a system in to subsystems, Allocation of subsystems, Implementation Modeling: Overview of implementation, Fine-tuning classes, Fine-tuning generalizations, Realizing associations, Testing.	**CO1,CO2,CO3,CO4**

Learning Resources
Text Books
1. “Object-Oriented Modeling and Design with UML” Michael Blaha, James Rumbaugh Second Edition Pearson Education 2005
References
1. Project Management for Business, Engineering and Technology Nicholas, J. and Steyn Second Edition H., ELSEVIER. 2004 2. Project Planning, Analysis, Selection, Implementation and Review Prasanna Chandra Ninth Edition New Delhi, Tata McGraw Hill Publications 2000
E-Recourses and other Digital Material
1. file:///C:/Users/ide%2063/Downloads/Object%20Oriented%20Modeling%20&%20Design%20Using%20UML%20(%20PDFDrive%20).pdf 2. https://link.springer.com/book/10.1007/978-3-319-24280-4 3. https://nptel.ac.in/courses/106105153 4. https://edutechlearners.com/download/books/OOSE/OOAD.pdf

PVP SIDDHARTHA INSTITUTE OF TECHNOLOGY, KANURU, VIJAYAWADA
(AUTONOMOUS)
INFORMATION TECHNOLOGY

CRYPTOGRAPHY

(Honors)

Course Code	20IT6401	**Year**	II	**Semester**	II
Course Category	HONORS	**Branch**	IT	**Course Type**	Theory
Credits	4	**L-T-P**	4-0-0	**Prerequisites**	Computer Networl Number Theory
Continuous Internal Evaluation :	30	**Semester End Evaluation:**	70	**Total Marks:**	100

Course Outcomes		
Upon Successful completion of course, the student will be able to		
CO1	Understand various attacks , types of cryptography, cryptographic data integrity algorithms and basics of Email and IP security	L2
CO2	Identify various cryptographic techniques	L3
CO3	Interpret various cryptographic data integrity algorithms	L2
CO4	Apply the field of cryptography while designing security applications.	L3

Contribution of Course Outcomes towards achievement of Program Outcomes & Strength of correlations (3:High, 2: Medium, 1:Low)

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	3												2	2
CO2		3											2	2
CO3	3												2	2
CO4	3												2	2

Syllabus		
Unit No	**Contents**	**Mapped CO**
I	**Security Fundamentals:** Security Attacks, Security Services, Security Mechanisms, A model for Network security.	**CO1**
II	**Secret Key Cryptography:** Symmetric cipher model, Block and Stream ciphers, Data Encryption Standard (DES), Strength of DES, Block cipher design principles and modes of operation, Multiple encryption and Triple DES, AES Structure.	**CO1, CO2, CO4**
III	**Public-key Cryptography:** Principles of public-key crypto systems, RSA algorithm, Diffie-Hellman key exchange, Introduction to elliptic curve cryptography.	**CO1, CO2, CO4**
IV	**Hash Functions and Digital Signatures:** Cryptographic hash functions, Applications of cryptographic hash functions, secure hash algorithm, authentication algorithms- HMAC, Digital signatures, Digital Signature algorithm.	**CO1, CO3, CO4**
V	**E-mail Security and IP Security:** E-mail Security: PGP, S/MIME. IP Security: Overview, IP Security Architecture, Authentication Header, Encapsulating Security Payload.	**CO1, CO4**

Learning Resources
Text Books
1. Cryptography and Network Security Principles and practice by W. Stallings 7th edition Pearson Education Asia 2017 2. Cryptography and Network Security by Behrouz A. Forouzan and Debdeep Mukhopadhyay 2nd edition Tata McGraw Hill 2013
References
1. "Cryptography: Theory and Practice" Stinson. D. 3rd edition Chapman & Hall/CRC 2012 2. "Cryptography and Network Security" Atul Kahate Tata McGraw-Hill 2003
E-Recourses and other Digital Material
1. https://nptel.ac.in/courses/106106221 2. http://www.cs.vsb.cz/ochodkova/courses/kpb/cryptography-and-network-security_-principles-and-practice-7th-global-edition.pdf

PVP SIDDHARTHA INSTITUTE OF TECHNOLOGY, KANURU, VIJAYAWADA (AUTONOMOUS)
INFORMATION TECHNOLOGY

BIO-INFORMATICS
(Honors)

Course Code	20IT6401	**Year**	II	**Semester**	II
Course Category	HONORS	**Branch**	IT	**Course Type**	Theory
Credits	4	**L-T-P**	4-0-0	**Prerequisites**	-
Continuous Internal Evaluation :	30	**Semester End Evaluation:**	70	**Total Marks:**	100

Course Outcomes		
Upon Successful completion of course, the student will be able to		
CO1	Understand the basic concepts of Bioinformatics in Biological data analysis	L2
CO2	Identify protein structures and DNA,RNA Sturctures	L3
CO3	Classify different types of Biological Databases and Database Mining tools	L2
CO4	Interpret various Database mining tools and Gnome analysis.	L2

Contribution of Course Outcomes towards achievement of Program Outcomes & Strength of correlations (3:High, 2: Medium, 1:Low)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3													
CO2		3												
CO3	3													
CO4	3													

Syllabus

Unit No	Contents	Mapped CO
I	**Biology and Information:** Bioinformatics-A Rapidly maturing science, Computers in Biology and Medicine, Virtual doctor, Biological macromolecules as Information carriers.	**CO1**
II	**Protiens** : Molecular Interaction in Protein Structure, Protein functions, DNA and RNA Structure, DNA Cloning and Sequencing, Genes , Taxonomy and Evolution	**CO1, CO2**
III	**Biological Databases :** Biological Database Organization, Data Annotation and Database connectivity, Public Databases-National Center for BioTechnology Information(NCBI), European Bioinformatics Institute(EBI)	**CO1, CO3**
IV	**Database Mining Tools** : Sequence Similarity Search Tools :BLAST and FASTA, an Overview of Database Sequence Searching, Pattern Recognition Tools, Multiple Alignment and Phylogenetic Tree Analysis	**CO1, CO4**
V	**Genome Analysis**: The Genomic, Organization of Genes, The Genome Projects, The Human Genome, Comparative Genomes, Functional Genomes, Microarray and Bioarray Technology, Genomes as Gene Networks	**CO1, CO4**

Learning Resources
Text Books
1. Lukas K. Buehler, Hooman H. Rashidi, “Bioinformatics Basics” Applications in Biological Science and Medicine, 2/e, Taylor & Francis (CRC) Publications 2005
References
1. D.R. Westhead, J.H. Parish, “Bioinformatics” Viva books private limited, New Delhi (2003) 2. Att Wood, “Bioinformatics” Pearson Education, 2004 3. Bryan Bergeron, M.D, “Bioinformatics Computing” Pearson Education, 2003
E-Recourses and other Digital Material
1. https://nptel.ac.in/courses/102106065

PVP SIDDHARTHA INSTITUTE OF TECHNOLOGY, KANURU, VIJAYAWADA (AUTONOMOUS)
INFORMATION TECHNOLOGY

OPERATING SYSTEMS

Course Code	20IT3501	**Year**	III	**Semester**	I
Course Category	PC	**Branch**	IT	**Course Type**	Theory
Credits	3	**L-T-P**	3-0-0	**Prerequisites**	Programming for Problem Solving, Data structures
Continuous Internal Evaluation :	30	**Semester End Evaluation:**	70	**Total Marks:**	100

Course Outcomes		**Blooms Level**
Upon successful completion of the course, the student will be able to:		
CO1	Understand the structure and functionalities of operating systems.	L2
CO2	Apply various concepts to solve problems related to process synchronization, deadlocks and make an effective report.	L3
CO3	Apply different algorithms of CPU scheduling, Page replacement and disk scheduling.	L3
CO4	Analyze process, memory and storage management strategies. **(Assignment)**	L4

Contribution of Course Outcomes towards achievement of Program Outcomes & Strength of correlations (3:High, 2: Medium, 1:Low)														
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	3												3	
CO2			3											
CO3		3											3	
CO4		3												

SYLLABUS		
Unit No	**Contents**	**Mapped CO**
I	**Overview:** Introduction - What Operating Systems Do, Computer-System Organization, Computer-System Architecture, Operating-System Structure, Operating-System Operations Operating System Structures **-** Operating-System Services, User and Operating-System Interface, System Calls, Types of System Calls.	CO1
II	**Process Management:** Process Concept, Process Scheduling, Operations on Processes, Interprocess Communication. Threads - Overview, Multicore Programming, Multithreading Models. Process Scheduling - Basic Concepts, Scheduling Criteria, Scheduling Algorithms (First-Come, First-Served Scheduling, Shortest-Job-First Scheduling, Priority Scheduling, Round-Robin Scheduling.)	CO1, CO3, CO4

III	**Process Synchronization:** Background, The Critical-Section Problem, Peterson’s Solution, Synchronization Hardware, Mutex Locks, Semaphores, Classic Problems of Synchronization. Deadlocks - System Model, Deadlock Characterization, Methods for Handling Deadlocks, Deadlock Prevention, Deadlock Avoidance, Deadlock Detection, Recovery from Deadlock.	CO1, CO2
IV	**Memory Management:** Main Memory**-** Background, Swapping, Contiguous Memory Allocation, Segmentation, Paging, Structure of the Page Table. Virtual Memory - Background, Demand Paging, Copy-on-Write, Page Replacement, Basic Page Replacement, FIFO Page Replacement, Optimal Page Replacement, LRU Page Replacement, LRU-Approximation Page Replacement.	CO1, CO3,CO 4
V	**Storage Management:** File–System Interface**:** File Concept, Access Methods, Directory and Disk Structure. File–System Implementation - File-System Structure, File-System Implementation, Directory Implementation, Allocation Methods. Mass-Storage Structure - Overview of Mass-Storage Structure, Disk Structure, Disk Attachment, Disk Scheduling, FCFS Scheduling, SSTF Scheduling, SCAN Scheduling, C-SCAN Scheduling, LOOK Scheduling, Selection of a Disk-Scheduling Algorithm.	CO1, CO3,CO 4

Learning Resources	
Text book:	
1	Operating System Concepts, Abraham Silberchatz, Peter Baer Galvin, Greg Gagne, Ninth Edition, 2016, Wiley India.
References:	
1	Operating Systems - Internal and Design Principles, William Stallings, Ninth Edition, 2018, Pearson.
2	Operating Systems - Harvey M.Deitel, Paul J Deitel and David R.Choffnes , Third Edition, 2019, Pearson.
3	Operating Systems - A Concept based Approach- D.M. Dhamdhere, Second Edition, 2010, McGraw Hill.
e-Resources and other Digital Material:	
1	https://www.youtube.com/watch?v=z3Nw5o9dS7Q&list=PLsylUObW5M3CAGT6OdubyH6FztKfJCcFB
2	http://www.youtube.com/watch?v=MaA0vFKtew&list=PL88oxI15Wi4Kw1aEY2bC5l_4pouojjtd4

PVP SIDDHARTHA INSTITUTE OF TECHNOLOGY, KANURU, VIJAYAWADA
(AUTONOMOUS)
INFORMATION TECHNOLOGY

WEB TECHNOLOGIES

Course Code	20IT3502	**Year**	III	**Semester**	I
Course Category	PC	**Branch**	IT	**Course Type**	Theory
Credits	3	**L-T-P**	3-0-0	**Prerequisites**	Java
Continuous Internal Evaluation :	30	**Semester End Evaluation:**	70	**Total Marks:**	100

Course Outcomes		**Blooms Taxonomy Level**
Upon successful completion of the course, the student will be able to		
CO1	Understand the basic concepts in web design for efficient design of web applications.	**L2**
CO2	Identify applications comprising of various web technologies with varying complexity	**L3**
CO3	Apply the concepts of JDBC and Servlets to develop dynamic web applications	**L3**
CO4	Design and Develop web applications using JSP	**L3**

Contribution of Course Outcomes towards achievement of Program Outcomes & Strength of correlations (3:Substantial, 2: Moderate, 1:Slight)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2
CO1	3											3	3	3
CO2		3										3	3	3
CO3			3									3	3	3
CO4			3									3	3	3

Syllabus		
Unit No	**Contents**	**Mapped CO**
I	**Introduction To Web Technologies :**History of the web, Overview of HTTP, Introducing HTML, HTML Basic, HTML Headings, Links, Images, Tables, Frames, forms and HTML controls. **Introducing CSS**: Inline styles, external and internal style sheets, Style classes, multiple styles.	**CO1**
II	**Introducing JavaScript:** Embedding JavaScript in a HTML page, Handling Events, variables, Arrays, Objects, Operators, Control flow statements, functions **Working With XML:** Introduction to XML, XML Basics, Document Type Definition, XML Technologies: XHTML, DOM, SAX, Extensible HTML (XHTML), Java API for XML Processing: Document Object Model(DOM), SAX, Extensible Style Sheet Language Transformation(XSLT):XSLT Style sheet	**CO1, CO2**
III	**Working With Database:** Introducing JDBC, Exploring JDBC Drivers, Describing JDBC APIs, Creating a Simple Application, Working with Prepared Statement, Using Callable Statement.	**CO1, CO2, CO3**
IV	**Getting started with web applications:** Describing Servlets, Introducing the MVC architecture. **Working with Servlets**: Introducing Servlets, Exploring Servlet API, Introducing the Servlet Life Cycle, and Configuring Servlet in web.xml, Working with Servlet Config and Servlet Context Objects. Creating simple servlet Working with Http Servlet REQUESTS &RESPONSES: HTTP Servlet Request Interface, HTTP Servlet Response Interface, Understanding session tracking.	**CO1, CO2, CO3**
V	**Working With JSP**: Understanding JSP, Describing the JSP Life Cycle, Creating a Simple JSP pages, working with JSP basic tags and implicit objects, working with Java Beans and Action tags in JSP, Working with JSP standard Tag Library(JSTL): Describing JSTL core tags.	**CO1, CO2, CO3, CO4**

Learning Resources
Textbooks
1. Web Technologies (HTML, JavaScript, PHP, JAVA, JSP, ASP.NET, XML and AJAX), Black Book, Dreamtech Press, 2017.
References
1. JDBC, Servlets, and JSP, New Edition, Santhosh Kumar K, Kogent Learning Solutions Inc, Dreamtech Press, 2018 2. Web Technologies, Uttam K. Roy,Volume2, Oxford University,2010 2. 3. An Introduction to Web Design and Programming–Wang-Thomson 4. Professional Java Server Programming, S.AllamRaju and others, Apres(dreamtech) 5. Java Server Programming, Ivan Bayross and others, The XTeam, SPD 6. Beginning Web Programming-Jon Duckett WROX. 7. Java Server Pages, Pekowsky, Pearson.
e-Resources and other Digital Material
1. http://nptel.ac.in/courses/106105084/13 2. http://www.w3schools.com/ 3. https://www.javatpoint.com/html-tutorial

PVP SIDDHARTHA INSTITUTE OF TECHNOLOGY, KANURU, VIJAYAWADA
(AUTONOMOUS)
INFORMATION TECHNOLOGY

COMPUTER NETWORKS
(Common to CSE & IT)

Course Code	20IT3503	**Year**	III	**Semester**	I
Course Category	PC	**Branch**	IT	**Course Type**	Theory
Credits	3	**L-T-P**	3-0-0	**Prerequisites**	--
Continuous Evaluation :	30	**Semester End Evaluation:**	70	**Total Marks:**	100

Course Outcomes		
Upon successful completion of the course, the student will be able to		
CO1	Understand the basic concepts and protocols of different layers.	**L2**
CO2	Apply Error Correction or MAC Protocol mechanism for a given scenario.	**L3**
CO3	Apply various Addressing mechanisms /Routing protocols for a given network.	**L3**
CO4	Apply appropriate Transport & Application layer protocol for a given context.	**L3**
CO5	Analyze the given scenario and use appropriate methods/mechanisms/protocols for designing a network.**(Assignment)**	**L4**

Contribution of Course Outcomes towards achievement of Program Outcomes & Strength of correlations (3:Substantial, 2: Moderate, 1:Slight)

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	3												3	
CO2	3												3	
CO3	3							2					3	
CO4	3							3					3	
CO5		3							2	2			3	

Syllabus		Mapped CO
Unit No.	**Contents**	
I	**Introduction :-**Networks, Network Types, Network Models :-The Protocol Layering , TCP/IP Protocol Suite, The OSI Model. Physical Layer :-Transmission Media - Guided Media, Un-Guided Media Data-Link Layer: Introduction to Data-Link Layer - Introduction, Link-Layer Addressing. Error Detection and Correction - Introduction, Cyclic Redundancy Check. Data Link Control (DLC) - DLC Services. Media Access Control (MAC) - Random Access, Controlled Access.	**CO1, CO2**
II	**Network Layer:** Introduction to Network Layer - Network-Layer Services, Packet Switching, Network-Layer Performance, IPv4 Addresses, Forwarding of IP Packets. Next Generation IP- IPv6 Addressing, The IPv6 Protocol.	**CO1, CO2, CO5**
III	**Network-Layer Protocols -** Internet Protocol (IP), Unicast Routing - Introduction, Routing Algorithms- Distance vector and Link State Routing, Unicast Routing Protocols.	**CO1, CO2, CO5**
IV	**Transport Layer:** Introduction to Transport Layer-Introduction, Transport-Layer Protocols. Transport Layer Protocols-Introduction, User Datagram Protocol(UDP), Transmission Control Protocol(TCP)	**CO1, CO3, CO4, CO5**
V	**Application Layer:** Standard Client-Server Protocols-World Wide Web and HTTP, FTP, Electronic Mail, Telnet, Secure Shell (SSH), Domain Name System (DNS)	**CO1, CO3, CO4**

Learning Resources
Text Books
1.Data Communications and Networking, Behrouz A. Forouzan, Fifth Edition, McGrawHill
References
1. Computer Networking A Top-Down Approach, James F. Kurose, Keith W. Ross, Sixth Edition, Pearson Education 2. Computer Networks - A Systems Approach, Larry L. Peterson, Bruce S. Davie, Fifth Edition, Morgan Kaufmann.
e-Resources& other digital material
1. https://nptel.ac.in/courses/106/105/106105183/ 2. https://nptel.ac.in/courses/106/105/106105081/ 3. https://www.youtube.com/playlist?list=PLEAYkSg4uSQ2NMmzNNsEK5RVbhxqx0BZF

CYBER LAWS
(Open Elective – I)

Course Code	20IT2501A	**Year**	III	**Semester**	I
Course Category	OE-1	**Branch**	Offered by IT	**Course Type**	Theory
Credits	3	**L-T-P**	3-0-0	**Prerequisites**	-
Continuous Internal Evaluation :	30	**Semester End Evaluation:**	70	**Total Marks:**	100

Course Outcomes		**Blooms Taxonomy Level**
Upon successful completion of the course, the student will be able to		
CO1	Understand the basic concepts of Section 80 of IT Act 2000, Cyber Crime, Computer Crime, Internet Theft/Fraud, Goods and Services.	**L2**
CO2	Demonstrate the basic concepts of Cognizable and Non-Cognizable Offences, Hacking, Teenage Web Vandals, Prevalence and Victimology, Consumer Protection Act.	**L2**
CO3	Identify the concepts of Arrest for "About to Commit" an Offence Under the IT Act, A tribute to Draco, Cyber Fraud, Computer as Commodities, Consumer Complaint.	**L3**
CO4	Explain the concepts of Arrest, But No Punishment, Cyber Cheating, Theft of Intellectual Property, Restrictive and Unfair Trade practices	**L2**

Contribution of Course Outcomes towards achievement of Program Outcomes & Strength of correlations (3:Substantial, 2: Moderate, 1:Slight)														
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	3					3	3	3					3	3
CO2	3					3	3	3					3	3
CO3		3				3	3	3					3	3
CO4	3					3	3	3					3	3

Syllabus		
Unit No	**Contents**	**Mapped CO**
I	**The IT Act, 2000:A Critique:** Crimes in Millennium, Section 80 of the IT Act, 2000-AWeapon or a Farce?, Forgetting the Line between Cognizable and Non-Cognizable Offences, Arrest for “About to Commit” an Offence Under the IT Act, A tribute to Draco, Arrest, But No Punishment	CO1, CO2, CO3, CO4
II	**Cyber Crime and Criminal Justice: Penalties, Adjudication and Appeals Under the IT Act, 2000:** Concept of Cyber Crime and the IT Act, 2000, Hacking, Teenage Web Vandals, Cyber Fraud and Cyber Cheating.	CO1, CO2, CO3, CO4
III	**Traditional Computer Crime: Early Hacker and Theft of Components:** Traditional Problems, Recognizing and Defining Computer Crime, Phreakers: Yesterday’s Hackers, Hacking, Computer as Commodities, Theft of Intellectual Property.	CO1, CO2, CO3, CO4
IV	**Identity Theft and Identity Fraud:** Typologies of Internet Theft/Fraud, Prevalence and Victimology, Physical Methods of Identity Theft.	CO1, CO2, CO3, CO4
V	**Protection of Cyber consumers in India:** Are Cyber consumers Covered under the Consumer Protection Act?, Goods and Services, Consumer Complaint, Restrictive and Unfair Trade practices	CO1, CO2, CO3, CO4

Learning Resources
Text books
1. Vivek Sood, “Cyber Law Simplified”, Tata McGraw Hill. 2. Marjie T. Britz, “Computer Forensics and Cyber Crime”, Person. 3. Ferrera, “Cyber Laws Texts and Cases”, Cengage.
References
1. Vakul Sharma, "Handbook Of Cyber Laws" Macmillan India Ltd, 2 nd Edition,PHI,2003. 2. Justice Yatindra Singh, "Cyber Laws", Universal Law Publishing, 1 st Edition,New Delhi, 2003. 3. Sharma, S.R., “Dimensions Of Cyber Crime”, Annual Publications Pvt. Ltd., 1st Edition, 2004. 4. Augastine, Paul T.,” Cyber Crimes And Legal Issues”, Crecent Publishing Corporation, 2007
e-Resources and other Digital Material
1. https://www.coursera.org/lecture/cyber-conflicts/introduction-to-cybercrime-and-fundamental-issues-xndSq 2. https://www.youtube.com/watch?v=F7mH5vz1qEI&list=PLf8YqCm9HoI6fb4LdoY2tFgJfM0PrgInS&ab_channel=ComputingforAll 3. https://www.youtube.com/watch?v=F7mH5vz1qEI&t=41s&ab_channel=ComputingforAll

AIR POLLUTION AND CONTROL

(Open Elective – I)

Course Code	20CE2501A	**Year**	III	**Semester**	I
Course Category	OE-1	**Branch**	Offered by CE	**Course Type**	Theory
Credits	3	**L-T-P**	3-0-0	**Prerequisites**	-
Continuous Internal Evaluation :	30	**Semester End Evaluation:**	70	**Total Marks:**	100

Course Outcomes		**Blooms Taxonomy Level**
Upon successful completion of the course, the student will be able to		
CO1	**Understand** the various types of air pollutants and their effects.	**L2**
CO2	**Examine** the behavior of air pollutants with reference to meteorological parameters	**L3**
CO3	**Analyze** the samples, pollutants from atmosphere	**L4**
CO4	**Identify and Understand** the different methods to control the particulate matter	**L4**
CO5	**Categorize and understand** the methods for the control of pollutants from gaseous emissions	**L4**

Contribution of Course Outcomes towards achievement of Program Outcomes & Strength of correlations (3:Substantial, 2: Moderate, 1:Slight)

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	2	2				2	2						2	2
CO2	2	2				2	2						2	2
CO3	3	3	3			3	3						3	3
CO4	2	2	2		2	3	3						2	3
CO5	2	2	2		2	3	3						2	3

Syllabus		
Unit No	**Contents**	**Mapped CO**
I	**AIR POLLUTION & EFFECTS** Air pollution - definitions-scope, significance -air pollutants -classification –natural and artificial-primary and secondary air pollutants. Effect of air pollutants on man-material and vegetation-global effects of air pollution greenhouse effect, acid rains and ozone layer threat.	**CO1**
II	**METEROLOGY AND PLUME DISPERSION** Properties of atmosphere-heat, pressure, wind forces, moisture and relative humidity influence of meteorological phenomenon on air quality- wind rose diagram, inversions and Plume behavior, Gaussian model for plume dispersion.	**CO2**
III	**SAMPLING OF AIR POLLUTION**: Stack sampler; Sampling Procedure- Sampling point – size – Isokinetic Conditions – Sampling of Particulate matter and Gases. Sampling methods–Indian standard methods of analysis of SO_2 and NO_x gases- Air Quality and Emission standards.	**CO3**
IV	**METHODS OF CONTROLLING AIR POLLUTION** Different means of control of effluent discharges into the atmosphere. Control of Particulate matter by equipment -Settling chamber, inertial separators, fabric filters, wet scrubbers, Electrostatic Precipitators	**CO4**
V	**CONTROL OF GASEOUS POLLUTANTS:** Controlling methods of Gaseous Emissions- combustion, adsorption, absorption,closed collections and recovery systems- Control of SO_2 and NO_x gases.	**CO5**

Learning Resources
Text books
1. Air Pollution and Control by Rao M.N and Rao, H.N., Tata McGraw Hill, New Delhi 2007. 2. Environmental Engineering and Management, (2nd Edition) by Suresh, S. K. Kartarai & Sons, 2005.
References
1. An Introduction to Air pollution by Trivedy, R.K., B. S. Publications, 2005. 2. Air pollution by Wark and Warner, Addison-Wesley Publications, 1998.
e-Resources and other Digital Material
https://nptel.ac.in/courses/105102089/8

SENSOR TECHNOLOGY

(Open Elective – I)

Course Code	20EC2501A	**Year**	III	**Semester**	I
Course Category	OE-1	**Branch**	Offered by EC	**Course Type**	Theory
Credits	3	**L-T-P**	3-0-0	**Prerequisites**	Nil
Continuous Internal Evaluation:	30	**Semester End Evaluation:**	70	**Total Marks:**	100

Course Outcomes	
Upon successful completion of the course, the student will be able to	
CO1	**Understand** the concept of sensors and its characteristics. (L2)
CO2	**Select** the physical principles of sensing based on sensor signals and systems (**L**3)
CO3	**Identify** the sensor interfacing with various electronics circuits (L3)
CO4	**Utilize** the practical approach in design of technology based on different sensors.(L3)
CO5	**List** various sensor materials and technology used in designing sensors.(L4)

Mapping of course outcomes with Program outcomes (CO/ PO/PSO Matrix)
Note: 1- Weak correlation 2-Medium correlation 3-Strong correlation
*** - Average value indicates course correlation strength with mapped PO**

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2											2		
CO2	3												3	
CO3	2				2								2	
CO4	2				2								2	
CO5		2												2
Average	**3**	**2**			**2**							**2**	**3**	**2**

Syllabus		
Unit No.	**Contents**	**Mapped CO**
I	**Sensors Fundamentals and Characteristics** Sensors, Signals and Systems; Sensor Classification; Units of Measurements; Sensor Characteristics	CO1,CO2
II	**Physical Principles of Sensing** Electric Charges, Fields, and Potentials; Capacitance; Magnetism; Induction; Resistance; Piezoelectric Effect; Hall Effect; Temperature and Thermal Properties of Material; Heat Transfer; Light; Dynamic Models of Sensor Elements	CO1,CO2
III	**Interface Electronic Circuits** Input Characteristics of Interface Circuits, Amplifiers, Excitation Circuits, Analog to Digital Converters, Direct Digitization and Processing, Bridge Circuits, Data Transmission, Batteries for Low Power Sensors	CO1,CO3
IV	**Sensors in Different Application Area** Occupancy and Motion Detectors; Position, Displacement, and Level; Velocity and Acceleration; Force, Strain, and Tactile Sensors; Pressure Sensors, Temperature Sensors	CO1,CO4
V	**Sensor Materials and Technologies** Materials, Surface Processing, Nano-Technology	CO1,CO5

Learning Resources
Text Books
1. J. Fraden, Handbook of Modern Sensors:Physical, Designs, and Applications, AIP Press, Springer 2. D. Patranabis, Sensors and Transducers, PHI Publication, New Delhi
Reference Books
1. Mechatronics- Ganesh S. Hegde, Published by University Science Press (An imprint of Laxmi Publication Private Limited).
e- Resources & other digital material
1. http://www.infocobuild.com/education/audio-video-courses/electronics/IndustrialInstrumentation-IIT-Kharagpur/lecture-34.html

ELECTRONIC INSTRUMENTATION
(Open Elective – I)

Course Code	20EC2501B	Year	III	Semester	I
Course Category	OE - 1	**Branch**	Common to All	**Course Type**	Theory
Credits	3	**L-T-P**	3-0-0	**Prerequisites**	Nil
Continuous Internal Evaluation:	30	**Semester End Evaluation:**	70	**Total Marks:**	100

Course Outcomes	
Upon successful completion of the course, the student will be able to	
CO1	**Comprehend** the concepts of Electronic instrumentation (L2)
CO2	**Identify** the Performance characteristics of instruments (L3)
CO3	**Illustrate** the different types of Signal Generator, Wave Analyzers& Bridges (L3)
CO4	**Analyze** the various types of Oscilloscopes (L4)
CO5	**Illustrate** the concept of various types of Transducers.(L3)

Mapping of course outcomes with Program outcomes (CO/ PO/PSO Matrix)
Note: 1- Weak correlation 2-Medium correlation 3-Strong correlation
* - Average value indicates course correlation strength with mapped PO

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO1	PSO2
CO1	2									2			2	2
CO2	2									2			2	2
CO3	3									2			2	2
CO4		2								2			2	2
CO5	2									2			2	2
Average	**2**	**2**								**2**			**2**	**2**

Syllabus		
Unit No.	**Contents**	**Mapped CO**
I	**Performance characteristics of instruments:** Static characteristics, Errors in Measurement, Dynamic Characteristics, DC Voltmeters- Multi range, Range extension, Thermo couple type RF ammeter, Ohmmeters series type, shunt type, Miltimeteres for Voltage, Current and resistance measurements.	CO1,CO2
II	**Signal Generator& Wave Analyzers:** Fixed and variable signal generators, AF oscillators, Standard signal generator, AF sine and square wave signal generators, Function Generators, Basic wave analyzers, Frequency selective wave analyzers, Hetero- dyne wave analyzer, Harmonic Distortion Analyzers, Spectrum Analyzers.	CO1,CO3
III	**Oscilloscopes:** Dual trace oscilloscope, Measurement of amplitude, period and frequency, Sampling oscilloscope, storage oscilloscope, digital readout oscilloscope, digital storage oscilloscope.	CO1,CO4
IV	**Bridges:** Wheatstone Bridge, AC Bridges Measurement of inductance-Maxwell's bridge, Measurement of capacitance - Schearing Bridge. Wien Bridge, Q-meter.	CO1,CO3
V	**Transducers:** Resistance, Capacitance, inductance, Strain gauges, LVDT, Piezo Electric transducers, Resistance Thermometers, Thermocouples, Thermistors, Sensistors, force, pressure, velocity, humidity, moisture, speed, Data acquisition system.	CO1,CO5

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Learning Resources
Text Books
1. Electronic instrumentation, - H.S.Kalsi, Tata McGraw Hill, 2nd edition 2004. 2. Modern Electronic Instrumentation and Measurement Techniques – A.D. Helfrick and W.D. Cooper, PHI, 5th Edition, 2002.
Reference Books
1. Electronic Instrumentation & Measurements - David A. Bell, PHI, 2nd Edition,2003. 2. Electronic Test Instruments, Analog and Digital Measurements - Robert A.twitter, Pearson Education, 2nd Edition,2004

ELECTRICAL SAFETY

(Open Elective – 1)

Course Code	20EE2501A	**Year**	III	**Semester**	I
Course Category	OE -I	**Branch**	Offered by EEE	**Course Type**	Theory
Credits	3	**L-T-P**	3-0-0	**Prerequisites**	-
Continuous Internal Evaluation:	30	**Semester End Evaluation:**	70	**Total Marks:**	100

Course Outcomes	
Upon successful completion of the course, the student will be able to	
CO1	**Understand** the Indian power sector organization and Electricity rules, electrical safety in residential, commercial, agriculture, hazardous areas and use of fire extinguishers. **(L2)**
CO2	**Assess** the Electrical Safety measures in operation and maintenance. **(L3)**
CO3	**Apply** the **s**afety measures during installation, testing and commissioning. **(L3)**
CO4	**Analyze** the Electrical Safety, Electric Shocks and Their Prevention. **(L4)**
CO5	**Examine** the hazardous areas and the fire extinguishers. **(L4)**
CO6	**Submit** a report on safety measures.

Contribution of Course Outcomes towards achievement of Program Outcomes & Strength of correlations (3:High, 2: Medium, 1:Low)

	PO1	PO2	PO_3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1														
CO2	3					1		1				1		
CO3	2							1				1		
CO4		3				1								
CO5		3												
CO6	3	3						3	3	3				

SYLLABUS		
Unit No.	**Contents**	**Mapped CO**
I	**Introduction To Electrical Safety, Shocks And Their Prevention:** Terms and definitions, objectives of safety and security measures, Hazards associated with electric current and voltage, principles of electrical safety, Approaches to prevent Accidents. Primary and secondary electrical shocks, possibilities of getting electrical shock and its severity, medical analysis of electric shocks and its effects, shocks due to flash/ Spark over's, prevention of shocks, safety precautions against contact shocks, flash shocks, burns, residential buildings and shop.	CO1, CO2 CO3, CO4, CO6

II	**Electrical Safety in Residential, Commercial and Agricultural Installations**: Wiring and fitting –Domestic appliances –water tap giving shock –shock from wet wall –fan firing shock –multi-storied building –Temporary installations – Agricultural pump installation –Do's and Don'ts for safety in the use of domestic electrical appliances.	CO1, CO2 CO4, CO6
III	**Electrical Safety during Installation, Testing and Commissioning, Operation and Maintenance**: Preliminary preparations –safe sequence –risk of plant and equipment –safety documentation –field quality and safety -personal protective equipment –safety clearance notice –safety precautions –safeguards for operators –safety.	CO1, CO3 CO4, CO6
IV	**Electrical Safety in Hazardous Areas**: Hazardous zones –class 0,1 and 2 –spark, flashovers and corona discharge and functional requirements –Specifications of electrical plants, equipment's for hazardous locations **Equipment Earthing**: Introduction, Equipment earthing, Functional requirements of Earthing system, Neutral grounding, Protection against energized Metal parts.	CO1, CO2, CO5, CO6
V	**Fire Extinguishers**: Fundamentals of fire-initiation of fires, types; extinguishing techniques, prevention of fire, types of fire extinguishers, fire detection and alarm system; CO_2, Halogen gas and foam schemes.	CO1, CO5, CO6

Learning Resources
Text Books
1. Rao, S. and Saluja, H.L., "Electrical Safety, Fire Safety Engineering and Safety Management", Khanna Publishers, 4th edition, 2020 2. John Codick, "Electrical safety hand book", McGraw Hill Inc., 3rd edition, 2006
Reference Books
1. Cooper.W.F, "Electrical safety Engineering", Newnes-Butterworth Company, 3rd edition, 1998. 2. Kothari, D.P and Nagrath, I.J., "Power System Engineering", McGraw Hill, 3rd edition, 2019. 3. Wadhwa, C.L., "Electric Power Systems", New Age International, 8th edition, 2004.

DESIGN THINKING

(Open Elective – 1)

Course Code	20ME2501A	Year	III	Semester	I
Course Category	OE-I	Offering Branch	ME	Course Type	Theory
Credits	3	L-T-P	3-0-0	Pre-requisites	Nil
Continuous Internal Evaluation	30	Semester End Evaluation	70	Total Marks	100

Course Outcomes: Upon successful completion of the course, the student will be able to				
CO	**Statement**	**Skill**	**BTS**	**Units**
CO1	Understand the principles of design thinking and its approaches	Understand	L2	1,2,3,4,5
CO2	Apply the empathy, the Define phase and develop an idea through ideation Techniques in human-centered design problems.	Apply	L3	1,2,3
CO3	Apply the design thinking techniques for innovation processes	Apply	L3	1,5
CO4	Analyze the prototype and test in a design thinking context.	Analyze	L4	1,4

Contribution of Course Outcomes towards achievement of Program Outcomes& Strength of correlations(3:High, 2:Moderate,1: Low)														
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	3			2	2		3	3	2	2	2	3	3	
CO2	3			2	2		3	3	2	2	1	3	3	
CO3	3			2	2		3	3	3	2	1	3	3	
CO4	3			2	2		3	3	2	2	1	3	3	

Syllabus		
Unit	**Contents**	**Mapped CO**
I	**Introduction to Design Thinking** An insight into Design, Design Methodology, the origin of Design thinking, Design thinking Vs Engineering thinking, the importance of Design Thinking, Design Vs Design thinking, understanding Design thinking and its various process models or frameworks, Stanford process models and its five stages, features of design thinking, application of Design thinking	**CO1** **CO2** **CO3** **CO4**
II	**Empathize in Design Thinking:** Human-Centered Design (HCD) process, explanation of HCD design thinking with examples, Role of Empathy in design thinking, persona creation and its importance, tools of empathy: Empathy maps, advantages and disadvantages of empathy maps, Customer journey map and its advantages & disadvantages, Mind Maps, and its uses, understanding empathy tools.	**CO1** **CO2**
III	**Define Phase and Ideation:** Explore define phase in Design Thinking, Methods of Define phase. Introduction to ideation Methods, convention methods for ideation, intuitive methods: Brainstorming, storyboard telling, select ideas from ideation Methods: Bingo Selection, Six Thinking Hats.	**CO1** **CO2**
IV	**Prototyping and Testing**: Prototyping and methods of prototyping, Difference between low fidelity and high-fidelity prototypes, paper prototyping, techniques for implementing paper prototyping, Digital prototyping, user testing methods, Advantages, and disadvantages of user Testing/ Validation	**CO1** **CO4**
V	**Design Thinking for Innovation**: Innovation in Design Thinking, Definition of innovation, the art of innovation, types of innovations, product innovation, process innovation, and organizational innovation, characteristics of innovation, levels of innovation, Innovation towards design, Case studies	**CO1** **CO3**

Learning Resources
Text books:
1. Changebydesign,Tim Brown,2009,HarperCollins 2. Engineering design, George E Dieter,4th Revisededition,2009 McGraw Hill.
Reference books
1. Design Thinking for Strategic Innovation, Idris Mootee,2013, JohnWiley&Sons 2. DesignThinking-TheGuidebook–FacilitatedbytheRoyalCivilserviceCommission, Bhutan 3. Design Methods: A Structured Approach for DrivingInnovation in Your Organization, Vijay Kumar, FirstEdition, 2012, Wiley 4. Human-Centered Design Toolkit: An Open SourceToolkittoInspireNewSolutionsintheDeveloping 5. World,IDEO,SecondEdition,2011, IDEO
e- Resources & other digital material
1. https://www.interaction-desiqn.ora/literature/topics/desiqn-thinkinq 2. https://www.interaction-desiqn.prq/literature/article/how-tq-<eve'op-anempath\capproach-in-design-thinking

LOGISTICS AND SUPPLY CHAIN MANAGEMENT

(Open Elective – 1)

Course Code	20ME2501B	**Year**	III	**Semester**	I
Course Category	OE-I	**Offering Branch**	ME	**Course Type**	Theory
Credits	3	**L-T-P**	3-0-0	**Prerequisites**	Nil
Continuous Internal Evaluation	30	**Semester End Evaluation**	70	**Total Marks**	100

Course Outcomes: Upon successful completion of the course, the student will be able to				
CO	**Statement**	**Skill**	**BTS**	**Units**
CO1	Explain the importance of Supply Chain Management	Understand	L2	1,2,3,4,5
CO2	Illustrate Inventory control techniques	Apply	L3	2
CO3	Illustrate various issues in Supply Chain Management	Apply	L3	5
CO4	Interpret supply chain strategies and procurement strategies	Apply	L3	4
CO5	Design Supply Chain Networks suitable for various market conditions	Analyse	L4	3

Contribution of Course Outcomes towards achievement of Program Outcomes& Strength of correlations(3:High, 2:Moderate,1: Low)														
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1		2							2		3			1
CO2		2							2		3			1
CO3		2							2		3			1
CO4		2							2		3			1
CO5		2							2		3			1

Syllabus		
UNIT	**Content**	**Mapped CO**
I	**Introduction to Supply Chain Management (SCM):** Concept of supply management and SCM, importance of supply chain flows, core competency, value chain, elements of supply chain efficiency, key issues in SCM, decision phases, supply chain integration, process view of a supply chain, competitive strategy and supply chain strategies, uncertainties in supply chain, supply chain drivers.	**CO1**
II	**Inventory Management**: Introduction, selective control techniques, cost involved in inventory system, single stage inventory control, economic lot size models, application to economic production quantity, effect of demand uncertainty, single period models, initial inventory, multiple order opportunities, deterministic models, quantity discounts. periodic and quantity review policies, mathematical modeling under known stock out costs and service levels, joint replenishment for multiple items,	**CO1** **CO2**

	inventory system constraints, working capital restrictions, and storage space restrictions.	
III	**Designing Supply Chain Network:** Introduction, network design, factors influencing network design, data collection, data aggregation, transportation rates, warehouse costs, capacities and locations, models and data validation, key features of a network configuration, impact of uncertainty on network design, network design in uncertain environment, value of information: Bull whip effect, information sharing, information and supply chain trade-offs, distribution strategies, direct shipment distribution strategies, transshipment and selecting appropriate strategies.	**CO1 CO5**
IV	**Supply Chain Integration:** Introduction, push-pull supply chains, identifying appropriate supply chain strategy, Sourcing and procurement, outsourcing benefits, importance of suppliers, evaluating a potential supplier, supply contracts, competitive bidding and negotiation. Purchasing, objectives of purchasing, relations with other departments, centralized and decentralized purchasing, purchasing procedure, types of orders, e-procurement, tender buying, role of business in supply chains.	**CO1 CO4**
V	**Issues in Supply Chain Management:** Introduction, risk management, managing global risk, issues in international supply chain, regional differences in logistics. Local issues in supply chain, issues in natural disaster and other calamities, issues for SMEs, organized retail in India, reverse logistics.	**CO1 CO3**

Learning Resources
Text books:
1. Simchi-Levi, D. Kaminsky, P.Simchi-Levi, E. and Ravi Shankar, Designing and Managing the Supply Chain: Concepts, Strategies and Case Studies, 3/e, Tata McGraw-Hill, 2008. 2. Chopra, S. and Meindl, Supply Chain Management: Strategy, Planning and Operations, 2/e, Pearson Education, 2004.
Reference books
1. Doebler, D.W. and Burt, D.N, Purchasing and Supply Management-Text and Cases, 6/e, McGraw-Hill, 1996. 2. Tersine, R.J, Principles of Inventory and Materials Management, 4/e, Prentice Hall, 1994.
E- Resources & other digital material
1. https://ocw.mit.edu/courses/engineering-systems-division/esd-273j-logistics-and-supply-chain management-fall-2009/lecture-notes/ 2. https://nptel.ac.in/courses/110/108/110108056/

PROGRAMMINNG WITH C

(Open Elective – 1)

Course Code	20CS2501A	**Year**	III	**Semester**	I
Course Category	OE-1	**Branch**	offered by CSE	**Course Type**	Theory
Credits	3	**L-T-P**	3-0-0	**Prerequisites**	-
Continuous Evaluation :	30	**Semester End Evaluation:**	70	**Total Marks:**	100

Course Outcomes		
Upon successful completion of the course, the student will be able to		
CO1	Understand the principles of structured programming and C constructs	**L2**
CO2	Apply suitable control constructs and array concepts to solve problems.	**L3**
CO3	Apply the concept of pointers, user defined data types and files to solve problems.	**L3**
CO4	Analyze the given problem and use modular programming approach to develop solutions.	**L4**

Contribution of Course Outcomes towards achievement of Program Outcomes & Strength of correlations (3:Substantial, 2: Moderate, 1:Slight)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3													
CO2	3													
CO3	3													
CO4		3							3	3				

Course Content

UNIT -1	**Introduction to C Programming Language**: variables, Data types, Constants, Identifiers, Syntax and Logical Errors in compilation, object and executable code, Structure of a C program: expressions and precedence, Expression evaluation, type conversion, Operators(**Bitwise Operators**: Logical Bitwise Operators, Shift Operators.), Storage classes (auto, extern, static and register),	**CO1,CO2**
UNIT -2	**Conditional Branching:** Writing and evaluation of conditional statements and branching with if, if-else, switch-case, ternary operator, go to statements. **IterativeStatements:**while,do-whileandforloops,Nestedloops,breakandcontinuestatements, Other Statements Related to Looping, Looping Applications, and Programming Examples.	**CO1,CO2, CO4**
UNIT -3	**Arrays:** Declaration, Accessing array elements, Storing values, Operations on arrays. Programming Examples-Calculate Averages. **Strings:** Introduction, String Input/output functions, String manipulation functions, String conversions, Programming Examples**.**	**CO1,CO2, CO3**
UNIT -4	**Functions:** Functions in C, Declaring a function, Parameters and return type of a function, passing parameters to functions, call by value, call by reference, User-Defined Functions, Programming Examples	**CO1,CO2, CO3, CO4**
UNIT -5	**Pointers:** Introduction, Declaration and Initialization of pointer variables, Pointer arithmetic and Arrays, Examples on Pointers. **Files in C:** Using Files in C, Read data from files, Writing data to files, Random access to files of records, Copying the Data . **Structures**- Introduction, Declaration and Initialization, Unions.	**CO1,CO2, CO3, CO4**

Learning Resources

Text Books	1. Programming for Problem Solving, Behrouz A. Forouzan, Richard F.Gilberg, CENGAGE, 2019
Reference Books	1. ProgramminginC, ReemaThareja,AICTEEdition, 2018,OxfordUniversityPress. 2. ComputerScience:AStructuredProgrammingApproachUsingC,B.A.ForouzanandR.F. Gilberg,Third Edition, 2007, CengageLearning. 3. B.A. Forouzan and R.F. Gilberg C Programming and Data Structures, Cengage Learning, (3rd Edition) 4. ProgramminginC,PradipDey,ManasGhosh,AICTEEdition,OxfordUniversityPress. 5. ProgrammingwithC,B. Gottfried,ThirdEdition,2017,Schaum'soutlines,McGrawHill. 6. ProblemSolving&ProgramDesigninC,JeriR.Hanly,EllotB.Koffman,5thEdition,Pearson
e-Resources & other digital material	1. http://cprogramminglanguage.net/ 2. https://www.geeksforgeeks.org/c-programming-language/ 3. https://www.greatlearning.in/academy/learn-for-free/courses/c-programming 4. https://www.udemy.com/course/the-complete-c-programming/5.https://nptel.ac.in/courses/106/105/106105171/

PVP SIDDHARTHA INSTITUTE OF TECHNOLOGY, KANURU, VIJAYAWADA
(AUTONOMOUS)
INFORMATION TECHNOLOGY

INFORMATION SECURITY

(Professional Elective – I)

Course Code	20IT4501A	**Year**	III	**Semester**	I
Course Category	PE - 1	**Branch**	IT	**Course Type**	Theory
Credits	3	**L-T-P**	3-0-0	**Prerequisites**	Number Theory Computer Networks
Continuous Internal Evaluation :	30	**Semester End Evaluation:**	70	**Total Marks:**	100

Course Outcomes		**Blooms Taxonomy Level**
Upon Successful completion of course, the student will be able to		
CO1	Understand the need of security, cryptographic mechanism and risks in computer systems and network	L2
CO2	Apply appropriate encryption principles and security mechanism in network transmission.	L3
CO3	Apply network security concepts in various real world scenarios.	L3
CO4	Analyze about system security mechanisms.	L4

Contribution of Course Outcomes towards achievement of Program Outcomes & Strength of correlations (3:Substantial, 2: Moderate, 1:Slight)

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	3												3	
CO2	3					3							3	
CO3	3					3							3	
CO4		3				3							3	

Syllabus		
Unit No	**Contents**	**Mapped CO**
I	Computer Security Concepts, Security Attacks, Security Services Mechanisms, A model for network security, Standards.	CO1
II	Symmetric Encryption Principles, Symmetric Block Encryption Algorithms, Random and Pseudorandom Numbers, Stream Ciphers and RC4 , Cipher Block Modes of Operation, Approaches to Message Authentication, Secure Hash Functions, Message Authentication Codes, Public-Key Cryptography Principles, Public-Key Cryptography Algorithms, Digital Signatures.	CO1 CO2
III	Key Distribution and User Authentication, Symmetric Key Distribution Using Symmetric Encryption, Kerberos, Key Distribution Using Asymmetric Encryption, X.509 Certificates, Public-Key Infrastructure, Federated Identity Management Transport-Level Security, Web Security Considerations, Secure Socket Layer and Transport Layer Security, Transport Layer Security HTTPS, Secure Shell (SSH)	CO1 CO2 CO3
IV	Electronic Mail Security, Pretty Good Privacy, S/MIME , Domain Keys Identified Mail , IP Security Overview , IP Security Policy, Encapsulating Security Payload, Combining Security Associations, Internet Key Exchange	CO1 CO3
V	Intruders, Intrusion Detection, Password Management, Types of Malicious Software, Viruses, Virus Countermeasures, Worms, Distributed Denial of Service Attacks, The Need for Firewalls, Firewall Characteristics, Types of Firewalls	CO1 CO4

Learning Resources
Text Books
1. Network Security Essentials Applications and Standards, William Stallings, Pearson Education. 4th Edition, 2011
References
1. Security in Computing, Fourth Edition, by Charles P. Pfleeger, Pearson Education 2. Cryptography And Network Security Principles And Practice, Fourth or Fifth Edition, William Stallings, Pearson 3. Modern Cryptography: Theory and Practice, by Wenbo Mao, Prentice Hall. 4. Principles of Information Security, Whitman, Thomson.5. Introduction to Cryptography, Buchmann, Springer.
E- Resources and other Digital Material **1. https://nptel.ac.in/courses/106106129**

PVP SIDDHARTHA INSTITUTE OF TECHNOLOGY, KANURU, VIJAYAWADA
(AUTONOMOUS)
INFORMATION TECHNOLOGY

DISTRIBUTED SYSTEMS

(Professional Elective – I)

Course Code	20IT4501B	**Year**	III	**Semester**	I
Course Category	PE -I	**Branch**	IT	**Course Type**	Theory
Credits	3	**L-T-P**	3-0-0	**Prerequisites**	Computer Networks
Continuous Internal Evaluation :	30	**Semester End Evaluation:**	70	**Total Marks:**	100

Course Outcomes		**Blooms Taxonomy Level**
Upon Successful completion of course, the student will be able to		
CO1	Understand the conceptual model and architectural model of a distributed system	L2
CO2	Apply the principles of remote invocation methods and file service architectures	L3
CO3	Use concurrency control and synchronization mechanisms in real world scenarios.	L3
CO4	Analyze concurrency control and synchronization mechanisms.	L4

Contribution of Course Outcomes towards achievement of Program Outcomes & Strength of correlations (3:Substantial, 2: Moderate, 1:Slight)

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	3												3	
CO2	3					3							3	
CO3	3					3							3	
CO4		3				3							3	

Syllabus		
Unit No	**Contents**	**Mapped CO**
I	**Introduction**: Examples of Distributed Systems, Trends in Distributed Systems, Focus on resource sharing, Challenges. System Models: Introduction, physical model, Architectural models.	**CO1**
II	**Inter process Communication**: Introduction, The API for internet protocols, External data representation and Multicast communication. Network virtualization: Overlay networks. Remote Invocation: Introduction, Request-reply protocols, Remote procedure call, Remote method invocation. Indirect Communication: Group communication, Publish-subscribe systems, Message queues, Shared memory approaches.	**CO1** **CO2**
III	**Peer to peer services and file system**: Peer-to-peer Systems, Introduction, Napster and its legacy, Peer-to-peer Middleware, Routing overlays. Distributed File Systems: Introduction, File service architecture, Name Services: Introduction, Domain Name System, Directory Services.	**CO1** **CO2**
IV	**Time and Global States**: Introduction, Clocks, events and process state, synchronizing physical clocks, Logical time and logical clocks, Global states Coordination and Agreement: Introduction, Distributed mutual exclusion, Elections, coordination and agreement in group communication, Consensus and related problems.	**CO1** **CO3** **CO4**
V	**Distributed Transactions**: Introduction, Flat and nested distribution transactions, Atomic commit protocols, Concurrency control in distributed transactions, Distributed deadlocks, Replication, fault tolerant services, transactions with replicated data.	**CO1** **CO3** **CO4**

Learning Resources
Text Books
1. George Coulouris, Jean Dollimore and Tim Kindberg, "Distributed Systems Concepts and Design", Fifth Edition, Pearson Education, 2012
References
1. Pradeep K Sinha, "Distributed Operating Systems: Concepts and Design", Prentice Hall of India,2007. 2. Tanenbaum A.S., Van Steen M., "Distributed Systems: Principles and Paradigms", Pearson Education, 2007. 3. Liu M.L., "Distributed Computing, Principles and Applications", Pearson Education, 2004. 4. Nancy A Lynch, "Distributed Algorithms", Morgan Kaufman Publishers, USA, 2003.
E- Resources and other Digital Material
1 . https://nptel.ac.in/courses/106/106/106106168/ 2. https://www.ejbtutorial.com/distributed-systems/introduction-to-distributed-systems

PVP SIDDHARTHA INSTITUTE OF TECHNOLOGY, KANURU, VIJAYAWADA
(AUTONOMOUS)
INFORMATION TECHNOLOGY

SOFTWARE REQUIREMENTS MANAGEMENT

(Professional Elective – I)

Course Code	20IT4501C	**Year**	III	**Semester**	I
Course Category	PE-I	**Branch**	IT	**Course Type**	Theory
Credits	3	**L-T-P**	3-0-0	**Prerequisites**	Software Engineering
Continuous Internal Evaluation :	30	**Semester End Evaluation:**	70	**Total Marks:**	100

Course Outcomes		**Blooms Taxonomy Level**
Upon Successful completion of course, the student will be able to		
CO1	Understand software requirements and estimation according to industry standards	L2
CO2	Apply the concepts of requirement elicitation, specifications and management	L3
CO3	Use the concepts of requirement management in real scenarios	L3
CO4	Analyze the concepts of software size estimation.	L4

Contribution of Course Outcomes towards achievement of Program Outcomes & Strength of correlations (3:Substantial, 2: Moderate, 1:Slight)

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	3												3	
CO2	3					3							3	
CO3	3					3							3	
CO4		3				3							3	

Syllabus		
Unit No	**Contents**	**Mapped CO**
I	**Introduction:** requirements, requirement engineering, requirements document, best way to write requirements, detailed requirements, difference between functional and nonfunctional requirements, system stakeholders, requirements engineering process, recognizing requirements engineering process problems suggesting a good requirements engineering process. Practical process improvement: Process maturity, process assessment, process improvement, top ten guidelines.	**CO1**
II	**Requirements Elicitation**: Assess system feasibility, identify and consult system stakeholders, record requirement sources, system's operating environment, using business concerns to drive requirements elicitation, domain constraints, collect requirements from multiple view points, use scenarios to elicit requirements, operational process. Requirements Analysis and Negotiation: System boundaries prioritize requirements, assess requirements risk.	**CO1 CO2**
III	**Describing Requirements**: Standard templates use language, use diagrams, supplement natural language requirements, specifying requirements quantitatively.	**CO1 CO2**
IV	**Requirements Management**: Uniquely identify each requirement, policies for requirements management, traceability policies, maintaining a traceability manual, change management policies, identify global system requirements, identify volatile requirements, record rejected requirements.	**CO1 CO2**
V	**Software Size Estimation**: Software estimation, size based estimation, two views of sizing, function point analysis, mark IIFPA, full function points, loc estimation and conversion between size measures.	**CO1 CO4**

Learning Resources
Text Books
1. Ian Sommerville and Pete Sawyer, Requirements Engineering: A good practice guide, John Wiley, 1997. 2. RajeshNaik, SwapnaKishore, Software Requirements and Estimation,TMH,2001.
References
1. Don, Managing Software Requirements, A Use Case Approach, 2/e, Dean, Addison-Wesley,2003. 2. Ian Graham, Requirements Engineering and Rapid Development, AddisonWesley,1998 3. S.Robertson , J.Robertson, Mastering the Requirements Process, 2/e, Pearson, 2006
E-Resources and other Digital Material 1. Requirements Engineering / Specification, NPTEL

PVP SIDDHARTHA INSTITUTE OF TECHNOLOGY, KANURU, VIJAYAWADA
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INFORMATION TECHNOLOGY

NEURAL NETWORKS

(Professional Elective – I)

Course Code	20IT4501D	**Year**	III	**Semester**	I
Course Category	PE-I	**Branch**	IT	**Course Type**	Theory
Credits	3	**L-T-P**	3-0-0	**Prerequisites**	Linear algebra, Statistics and Probability
Continuous Internal Evaluation :	30	**Semester End Evaluation:**	70	**Total Marks:**	100

Course Outcomes		**Blooms Taxonomy Level**
Upon Successful completion of course, the student will be able to		
CO1	Understand the fundamentals and types of neural networks, Fuzzy logic principles.	L2
CO2	Apply Back propagation networks for various problems	L3
CO3	Use Associative memory and Adoptive resonance theory for real world problems.	L3
CO4	Analyze the applications of ANN techniques for solving various problems.	L3

Contribution of Course Outcomes towards achievement of Program Outcomes & Strength of correlations (3:Substantial, 2: Moderate, 1:Slight)

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	3												3	
CO2	3					3							3	
CO3	3			3		3							3	
CO4			3			3							3	

Syllabus		
Unit No	**Contents**	**Mapped CO**
I	**Introduction to Artificial Intelligence System**: Neural Network, Fuzzy logic, Genetic Algorithm. Fundamentals of Neural Networks: Basic Concepts of Neural Network, Human Brain, Model of Artificial Neuron Neural Network Architecture: Single layer Feed-forward networks, Multilayer Feed-forward networks, Recurrent Networks, Characteristics of Neural networks, Learning methods, Early Neural Network Architectures-Rosenblatt's perceptron, Adaline Network, MADALINE Network.	CO1
II	**Back propagation Networks**: Back Propagation networks, Architecture of Back-propagation(BP) Networks, Back-propagation Learning, Effect of Tuning parameters of the Back propagation Neural Network, Selection of various parameters in BPN.	CO1 CO2
III	**Associative Memory**: Auto correlators, Hetero correlators, Wang et al"s Multiple Training Encoding Strategy, Exponential BAM, and Associative Memory for Real coded pattern pairs, Applications.	CO1 CO2 CO3
IV	**Adaptive Resonance Theory**: Introduction-Cluster structure, vector quantization, Classical ART networks, Simplified ART architectures, ART1-Architectre, Special features of ART1 models, ART1 algorithm, Illustration, ART2-Architecture of ART2, ART2 algorithm, Illustration, Applications-Character recognition using ART1.	CO1 CO2 CO3
V	**Applications of ANN**: Introduction, Direct applications-Pattern Classification, Associative memories, Optimization. Application areas-Applications in speech, applications in image processing	CO1 CO2 CO4

Learning Resources
Text Books
1. Neural Networks, Fuzzy Logic and Genetic Algorithms, S.Rajasekaran and G.A. Vijayalakshmi Pai, second edition, 2017, PHI Publications. 2. Artificial neural network, B. Yegnanarayana, PHIPublication, eleventh edition 2005.
References
1. Neural Networks for Pattern Recognition, Bishop, C. M., 1995, Oxford University Press. 2. Neuro-Fuzzy Systems, Chin Teng Lin, C. S. George Lee,PHI. 3. Build Neural Network with MS Excel sample by Joechoong.
1.https://www.coursera.org/learn/neural-networks-deep-learning 2. https://www.coursera.org/learn/machine-learning

PVP SIDDHARTHA INSTITUTE OF TECHNOLOGY, KANURU, VIJAYAWADA
(AUTONOMOUS)
INFORMATION TECHNOLOGY

DATA MINING

(Professional Elective – I)

Course Code	20IT4501E	**Year**	III	**Semester**	I
Course Category	PE - I	**Branch**	IT	**Course Type**	Theory
Credits	3	**L-T-P**	3-0-0	**Prerequisites**	DBMS
Continuous Internal Evaluation :	30	**Semester End Evaluation:**	70	**Total Marks:**	100

Course Outcomes		**Blooms Taxonomy Level**
Upon successful completion of the course, the student will be able to		
CO1	Understand the basic principles, process and techniques of data mining.	L2
CO2	Use preprocessing techniques on different datasets.	L3
CO3	Apply techniques and algorithms for Mining frequent patterns, classifying and clustering the data.	L3
CO4	Relate the data for mining frequent patterns, associations and classification in a real scenario.	L3
CO5	Analyze various mining techniques for a given case study.**(Assignment)**	L4

Contribution of Course Outcomes towards achievement of Program Outcomes & Strength of correlations (3:Substantial, 2: Moderate, 1:Slight)

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	3												3	
CO2		3				3							3	
CO3	3					3							3	
CO4		3				3							3	
CO5				3	3								3	

Syllabus		
Unit No	**Contents**	**Mapped CO**
I	**Introduction**: What is data mining? What kinds of data can be mined? What kinds of pattern can be mined? Which technologies are used? Which kinds of applications are targeted, Major Issues in Data Mining?	CO1
II	**Getting to Know Your Data**: Data objects and Attribute Types, Basic statistical descriptions of data, Measuring Data Similarity and Dissimilarity. Data Preprocessing: An overview, Data Cleaning, Data integration, Data Reduction, Data Transformation and Discretization.	CO1 CO2
III	**Mining frequent patterns, Associations and Correlations-** Basic Concepts, Frequent itemset Mining methods- Apriori Algorithm, Generating association rules from frequent itemsets, improving the efficiency of Apriori, A pattern growth approach for mining frequent itemsets. Which patterns are interesting- pattern evaluation methods	CO1 CO3 CO4
IV	**Classification**: Basic Concepts – Basic concepts, Decision Tree Induction, Bayes Classification Methods, Rule based Classification, Model evaluation and Selection, Techniques to improve Classification Accuracy.	CO1 CO3- CO5
V	**Cluster Analysis**: Basic Concepts and Methods- Cluster Analysis, partitioning methods, Hierarchical Methods and evaluation of Clustering	CO1 CO3- CO5

Learning Recourses
Text Books
1. Jiawei Han and Micheline Kamber, “Data Mining Concepts and Techniques” Third Edition, Elsevier, 2012.
References
1.Michael Steinbach, Vipin Kumar, Pang-Ning Tan, Introduction to data mining, 1/e, Addison Wesley, 2006 2. Margaret H. Dunham, Data Mining Introductory and Advanced Topics, 1/e, Pearson Publishers, 2006
e-Resources & other digital material
1. https://www.coursera.org/lecture/code-free-data-science/introduction-to-data-mining-hbb2V 2. https://onlinecourses.swayam2.ac.in/cec19_cs01/preview

PVP SIDDHARTHA INSTITUTE OF TECHNOLOGY, KANURU, VIJAYAWADA
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INFORMATION TECHNOLOGY

OPERATING SYSTEMS LAB

Course Code	20IT3551	**Year**	III	**Semester**	I
Course Category	PC	**Branch**	IT	**Course Type**	Lab
Credits	1.5	**L-T-P**	0-0-3	**Prerequisites**	Data structures
Continuous Internal Evaluation :	15	**Semester End Evaluation:**	35	**Total Marks:**	50

Course Outcomes		**Blooms Level**
Upon successful completion of the course, the student will be able to:		
CO1	Experiment with Unix system calls	L3
CO2	Identify the performance of page replacement algorithms	L3
CO3	Analyze the performance of the various process scheduling, Disk Scheduling algorithms.	L3
CO4	Develop algorithm for process synchronization, deadlock avoidance, detection and file allocation strategies	L3

Contribution of Course Outcomes towards achievement of Program Outcomes & Strength of correlations (3:High, 2: Medium, 1:Low)

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1					**3**									
CO2		**3**												
CO3		**3**											**3**	
CO4			**3**										**3**	

EXPERIMENTS

Experiment No	**Description**	**Mapped CO**
EXP-1	Execute various Unix system calls for process and file management	CO1
EXP-2	Write a program to simulate the following non pre-emptive CPU scheduling algorithms to find turnaround time and waiting time. a) FCFS b) SJF c) Round Robin (pre-emptive) d) Priority	CO3
EXP-3	Write a program to simulate Bankers algorithm for the purpose of deadlock avoidance.	CO4
EXP-4	Write a program to simulate page replacement algorithms a) FIFO b) LRU	CO2
EXP-5	Write a program to simulate page replacement algorithms a) Optimal b) LFU	CO2
EXP-6	Write a program to simulate disk scheduling algorithms a) FCFS b) SCAN	CO3
EXP-7	Write a program to simulate the concept of Dining-Philosophers problem	CO4

Learning Resources

Text book:

1	Operating System Concepts, Abraham Silberchatz, Peter Baer Galvin, Greg Gagne,9th Edition, 2016, Wiley India.

References:

1	Operating Systems - Internal and Design Principles, William Stallings, Ninth Edition, 2018, Pearson.
2	Operating Systems - Harvey M.Deitel, Paul J Deitel and David R.Choffnes, Third Edition, 2019, Pearson.
3	Operating Systems - A Concept based Approach- D.M. Dhamdhere, Second Edition, 2010, McGraw Hill.

e-Resources and other Digital Material:

1	https://www.youtube.com/watch?v=z3Nw5o9dS7Q&list=PLsylUObW5M3CAGT6OdubyH6FztKfJCcFB
2	http://www.youtube.com/watch?v=MaA0vFKtew&list=PL88oxI15Wi4Kw1aEY2bC5l_4pouojjtd4

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INFORMATION TECHNOLOGY

WEB TECHNOLOGIES LAB

Course Code	20IT3552	**Year**	III	**Semester**	I
Course Category	PC	**Branch**	IT	**Course Type**	Lab
Credits	1.5	**L-T-P**	0-0-3	**Prerequisites**	JAVA
Continuous Internal Evaluation :	15	**Semester End Evaluation:**	35	**Total Marks:**	50

Course Outcomes		**Blooms Level**
Upon Successful completion of course, the student will be able to		
CO1	Design and develop web applications using HTML, CSS, Java script, XML in a team environment.	**L3**
CO2	Develop web applications using JDBC	**L3**
CO3	Design and Develop applications using servlets	**L3**
CO4	Develop Server side programming that demonstrate the advanced Java Concepts(JSP)	**L3**

ContributionofCourseOutcomestowardsachievementofProgramOutcomes&Strengthofcorrelations (H:High,M:Medium,L:Low)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2
CO1			3		3							3	3	3
CO2			3		3							3	3	3
CO3			3		3							3	3	3
CO4			3		3							3	3	3

Exercise No	**Exercise**	**Mapped CO**
1	Design web applications using static HTML tags.	CO1
2	Design web pages using different types of CSS.	CO1
3	Apply Client side validations using JavaScript.	CO1

4	Create and save an XML document at the server, which contains information of multiple users. Write a program which takes User Id as input and returns the user details by taking the user information from the XML document.	CO1
5	Create dynamic application using JDBC.	CO2,CO3
6	Create different web applications using servlets	CO2,CO3
7	Authentication using JSP	CO2,CO4
8	Develop JSP application using JSTL and Custom Tags.	CO4
9	Students are encouraged to propose innovative ideas in the field of E- Commerce as projects. (Online banking, online job portal, online library, online ticket reservation, online banking etc..).(optional)	CO1-CO4

Learning Resources

Textbooks

1. WebTechnologies,BlackBook,KogentLearningSolutionsInc,DreamtechPress, 2018.
2. JDBC, Servlets, and JSP, New Edition, Santhosh Kumar K, Kogent Learning Solutions Inc, Dreamtech Press, 2018.

References

1. Core Servlets and Java Server Pages Volume 2 Core Technologies, Second Edition, Marty Hall and Larry Brown Pearson
2. Professional Java Server Programming S.Allam Raju and others Apres(dreamtech)
3. Java Server Programming, Ivan Bayross and others, The XTeam, SPD
4. Beginning Web Programming-Jon Duckett WROX, 2013,SecondEdition.

e-Resources and other Digital Material

1. http://nptel.ac.in/courses/106105084/13
2. http://www.w3schools.com/
3. https://www.javatpoint.com/html-tutorial

SOFT SKILLS

Course Code	20SS8551	**Year**	III	**Semester**	I
Course Category	SOC	**Branch**	IT	**Course Type**	Lab
Credits	2	**L-T-P**	1-0-2	**Prerequisites**	-
Continuous Internal Evaluation :	-	**Semester End Evaluation:**	50	**Total Marks:**	50

Course Outcomes		Blooms Taxonomy Level
Upon Successful completion of course, the student will be able to		
CO1	**Develop** logical and **Analytical** skill set through Case Studies	L3
CO2	**Proficient** in giving Presentations	L3
CO3	**Understand** the corporate etiquette	L2
CO4	**Develop** Competency in group discussion & Interviews	L3
CO5	**Present** themselves with corporate readiness	L3

Contribution of Course Outcomes towards achievement of Program Outcomes & Strength of correlations (H-High3, M-Medium-2, L- Low-1)

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO 1**	**PSO2**
CO1								2		2				
CO2									3	3		2		
CO3								2	1	2		1		
CO4									3	3				
CO5										3				

Syllabus		
Unit No	**Contents**	**Mapped CO**
1	• Soft Skills- Need & Importance. Intra & Inter Personal Skills • Campus to Corporate- Employability Skills- Need of the hour • SWOT Analysis. • Attitude- Developing Professional & Positive Attitude • Perception – Importance of analytical thinking.	CO1,CO2, CO5.
2	• Communication Skills – Need and Methods • Body-Language -I; How to interpret and understand other's body language • Body Language-II; How to improve one's own Body Language • Presentation Skills (Seminar Talk & Power Point Presentation)	CO1,CO2, CO4, CO5.
3	• Goal Setting- Need & Importance • Magic of Team Work. • Leadership Qualities. • Six Thinking Hats.	CO1, CO3.
4	• Accountability towards Work. • Paragraph Writing – Descriptive and Analytical with illustrations • Email Writing • Work Etiquette	CO1, CO3, CO5.
5	• Group Discussion (Open & Monitored) • Resume Preparation • Interview Skills • Mock Interviews	CO2, CO4, CO5.
6	• Vocabulary- Root Words (A representative Collection of 50) • Vocabulary for Competitive Exams (A list of 500 high frequency Words) • Idioms & Phrases • Verbal Analogies • Correction of Sentences • Sentence Completion – Course of Action • Cloze Test • Reading Comprehension (Skimming, Scanning & tackling different kinds of questions) • Phrasal Collocations (Representative collection of 50meanings along with sentential illustrations) • SWAR/ VERSANT Test	CO5.

Learning Resources	
Text Books	1. The ACE of Soft Skills by Gopala swamy Ramesh &Mahadevan Ramesh –Pearson 2. Working with Emotional Intelligence - David Goleman. 3. Developing Communication Skills by Krishna Mohan and MeeraBanerji; MacMillan India Ltd.,Delhi.
Reference Books	1. Soft Skills: Meenakshi Raman. 2. Audio—Visuals / Hand Outs (Compiled/Created by T&P Cell, P.V.P.Siddhartha Institute of Technology), Board & Chalk and Interactive

	Sessions
Semester End Evaluation	• **15 marks for Report- Which includes** 5marks for Resume 10 Marks for PPT (5M for PPT preparation & Presentation, 5M for Report Preparation on PPT) • **35 Marks for External Exam – Which includes** 10 marks for Viva with external examiner, 20 marks for Vocab test (Which is essential in Recruitment written test) 5 marks for E-mail Writing (which is important for the student to apply for the job through online, to give consent to job offer and to communicate in the work environment)

CONSTITUTION OF INDIA

(Common to all)

Course Code	20MC1501	**Year**	III	**Semester**	I
Course Category	MC	**Branch**	IT	**Course Type**	Theory
Credits	-	**L-T-P**	2-0-0	**Prerequisites**	--
Continuous Internal Evaluation:	30	**Semester End Evaluation:**	70	**Total Marks:**	100

Syllabus	
Unit No	**Contents**
I	**Introduction to Indian Constitution:** Constitutional history, constituent assembly, salient features of the constitution, significance of preamble, amending process of the constitution.
II	**Rights and Duties:** Citizenship, fundamental rights and directive principles, fundamental duties.
III	**Union Government:** President and vice president, election, removal and powers, Prime minister and council of ministers, parliament, supreme court, union, state relations, emergency provisions.
IV	**StateandLocalGovernments:**Governor,statelegislature,assemblyandcouncil, Chief minister and council of ministers, high court, rural and urban local governments with special reference to 73rd and 74th constitutional amendment acts.
V	**Other Constitutional and Statutory Bodies:** Comptroller and auditor general, election commission, finance commission, attorney general and advocate general, union public service commission(UPSC), state public service commissions(SPSCs), Tribunals, national human rights commission(NHRC).

Learning Resources

Text Books

1. J.C.Johari, Indian Government and Politics, Vishal Publications, Delhi,2009.
2. M.V.Pylee,IntroductiontotheConstitutionofIndia,5/e,VikasPublishingHouse,Mumbai,2007.

References

References:

1. D.D.Basu, Introduction to the Indian Constitution, 21/e,LexisNexis,Gurgaon,India,2011.
2. Subhas C.Kashyap, Our Constitution,2/e,National Book Trust India,NewDelhi,2013.

PVP SIDDHARTHA INSTITUTE OF TECHNOLOGY, KANURU, VIJAYAWADA
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INFORMATION TECHNOLOGY

SUMMER INTERNSHIP

Course Code	20IT3581A	**Year**	III	**Semester**	I
Course Category	PC	**Branch**	IT	**Course Type**	Practical
Credits	1.5	**L-T-P**	0-0-0	**Prerequisites**	-
Continuous Internal Evaluation :	0	**Semester End Evaluation:**	50	**Total Marks:**	50

Course Outcomes		
Upon Successful completion of course, the student will be able to		
CO1	Formulate problem analysis by gaining domain knowledge elaborate through modeling and implementation through state of the art technology available	L3
CO2	Development of solutions using generic and modular programs for real time applications.	L5
CO3	Developed strong networking / mentoring relationships in work place	L2
CO4	Conclude finding through effective oral presentations.	L3

Contribution of Course Outcomes towards achievement of Program Outcomes & Strength of correlations(3:Substantial,2: Moderate, 1:Slight)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1	2	2				1					3	2	2
CO2	1	2	2	1	1							3	2	2
CO3						1		1	3	2		2	2	2
CO4									2	2	2	3	2	2

PVP SIDDHARTHA INSTITUTE OF TECHNOLOGY, KANURU, VIJAYAWADA
(AUTONOMOUS)
INFORMATION TECHNOLOGY

COMPUTER NETWORKS

(MINOR)

Course Code	20IT5501	**Year**	III	**Semester**	I
Course Category	Minor	**Branch**	IT	**Course Type**	Theory
Credits	4	**L-T-P**	4-0-0	**Prerequisites**	-
Continuous Internal Evaluation :	30	**Semester End Evaluation:**	70	**Total Marks:**	100

Course Outcomes		
Upon Successful completion of course, the student will be able to		
CO1	Understand the basics of computer networks and the functions of OSI and TCP/IP reference model.	L2
CO2	Analyze various protocols in Data link layer, Transport Layer, and their mechanisms.	L3
CO3	Implement routing and congestion control algorithms.	L3
CO4	Analyze the real applications like electronic mail, www and multimedia.	L3

ContributionofCourseOutcomestowardsachievementofProgramOutcomes&Strengthofcorrelations(3:Substantial,2: Moderate, 1:Slight)

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	3												3	
CO2	3	3											3	
CO3			3				3						3	
CO4		3											3	

Syllabus		
Unit No	**Contents**	**Mapped CO**
	Introduction: Uses of Computer Networks, Network hardware, Network software, Networks Topologies, OSI, TCP/IP Reference models. **Physical Layer:** Guided Transmission media: twisted pairs, coaxial cable, fiber optics, Wireless transmission.	**CO1**
II	**Data link layer:** Design issues, framing, Error detection and correction. **Elementary data link protocols:** simplex protocol, A simplex stop and wait protocol for an error-free channel, A simplex stop and wait protocol for noisy channel. Sliding Window protocols: A one-bit sliding window protocol, A protocol using Go-Back-N, A protocol using Selective Repeat.	**CO1,CO2**
III	**Network Layer:** Design issues, Routing algorithms: shortest path routing, distance vector routing, Link State routing, Broadcast routing, Multicast routing. **Congestion Control Algorithms**, Internetworking, The Network layer in the internet.	**CO1,CO3**
IV	**Transport Layer:** The transport service, Elements of Transport protocols, The internet transport protocols: UDP, The internet transport protocols :TCP.	**CO1,CO2**
V	**Application Layer**: Domain name system, Electronic Mail; The World WEB, Streaming audio and video.	**CO1,CO4**

Learning Recourses
Text Books
1. Computer Networks -- Andrew S Tanenbaum, David. j. Wetherall, 5thEdition. Pearson Education/PHI
References
1. An Engineering Approach to Computer Networks-S. Keshav, 2ndEdition, Pearson Education. 2. Computer Networks, A Top-Down Approach –Behrouz A Forouzan, FirouzMosharraf. 3. Data Communications and Networking – Behrouz A. Forouzan. Third Edition TMH.
E-Recourses and other Digital Material
NPTEL VIDEO LECTURES : https://www.youtube.com/watch?v=O--rkQNKqls&list=PLbRMhDVUMngf-peFloB7kyiA40EptH1up

PVP SIDDHARTHA INSTITUTE OF TECHNOLOGY, KANURU, VIJAYAWADA
(AUTONOMOUS)
INFORMATION TECHNOLOGY

SOCIAL MEDIA ANALYTICS
(Honors)

Course Code	20IT6501	**Year**	III	**Semester**	I
Course Category	Honors	**Branch**	IT	**Course Type**	Theory
Credits	4	**L-T-P**	4-0-0	**Prerequisites**	Big Data Analytics
Continuous Internal Evaluation :	30	**Semester End Evaluation:**	70	**Total Marks:**	100

Course Outcomes		
Upon successful completion of the course, the student will be able to:		
CO1	Understand and Identify the various components of a web that can be used for mining process.	L2
CO2	Discover interesting patterns from Social Media Networks .	L3
CO3	Understand the structure of the web and the processes of Web crawling to create web applications.	L2
CO4	Analyze the emerging problems of social media analytics with sentiment analysis and opinion mining.	L3

Syllabus

Unit No	**Contents**	**Mapped CO**
I	**Defining Analytics in Social Media:** Analytics in Social Media, Social Network Landscape, The Analytics Process, The Future of Social Media Analytics **Web Mining: Information Retrieval and Web Search**: Basic Concepts of Information Retrieval, Information Retrieval Models	**CO1**
II	**Text and Web Page Pre-Processing**: Stop word Removal, Stemming, Other Pre-Processing Tasks for Text, Web Page Pre-Processing, Duplicate Detection **Social Network Analysis**: **HITS:** HITS Algorithm, Finding Other Eigen vectors, Relationships with Co-Citation and Bibliographic Coupling**,** Strengths and Weaknesses of HITS	**CO1,CO2**
III	**Web Crawling:** A Basic Crawler Algorithm, Implementation Issues, Universal Crawlers, Focused Crawlers, Topical Crawlers, Evaluation, Crawler Ethics and Conflicts, Some New Developments	**CO1, CO3**
IV	**Opinion Mining and Sentiment Analysis:** The Problem of Opinion Mining, Document Sentiment Classification, Sentence Subjectivity and Sentiment Classification, Mining Comparative Opinions, Opinion Search and Retrieval, Opinion Spam Detection.	**CO1, CO3,CO4**
V	**Web Usage Mining**: Data Modeling for Web Usage Mining, Discovery and Analysis of Web Usage Patterns **Recommender Systems and Collaborative Filtering:** The Recommendation Problem, Content-Based Recommendation, Collaborative Filtering: ***K***-Nearest Neighbor**(*K*NN),** Collaborative Filtering: Using Association Rules, Collaborative Filtering: Matrix Factorization	**CO1, CO3,CO4**

Learning Resources	
Text book:	
1	Social Media Analytics Strategy: Using Data to Optimize Business Performance Alex Gonçalves Las Vegas, Nevada, USA
2	Web Data Mining Exploring Hyperlinks, Contents, and Usage Data Bing Liu Second Edition Springer-Verlag Berlin Heidelberg
References :	
1	GautamShroff,“EnterpriseCloudComputing”,Cambridge,2010 Scott Granneman, “Google Apps Deciphered: Compute in the Cloud to Streamline Your Desktop”, Pearson Education, 2008.
2	Social Media Analytics Techniques and Insights from Extracting Business Value Out of Social media Matthew Gains ,Avinash Kohirkar IBM press
e-Resources and other Digital Material	
1	https://nptel.ac.in/courses/110107129
2	https://emplifi.io/resources/blog/social-media-analytics-the-complete-guide

PVP SIDDHARTHA INSTITUTE OF TECHNOLOGY, KANURU, VIJAYAWADA
(AUTONOMOUS)
INFORMATION TECHNOLOGY

SECURITY GOVERNANCE RISK MANAGEMENT
(Honors)

Course Code	20IT6501	**Year**	III	**Semester**	I
Course Category	Honors	**Branch**	IT	**Course Type**	Theory
Credits	4	**L-T-P**	4-0-0	**Prerequisites**	Cyber Security/Network Security
Continuous Internal Evaluation :	30	**Semester End Evaluation:**	70	**Total Marks:**	100

Course Outcomes		
Upon successful completion of the course, the student will be able to:		
CO1	Understand and determine the objectives necessary to achieve those outcomes	L2
CO2	Perform a comprehensive gap analysis of the requirements to move from the current state to the desired state of security	L3
CO3	Develop a strategy and roadmap to address the gaps, using available resources within existing constraints	L3
CO4	Create metrics and monitoring processes to Measure progress and guide implementation	L3

Syllabus		
Unit No	**Contents**	**Mapped CO**
I	**Governance Overview:** Origins of Governance, Governance Definition, Information Security Governance, Six Outcomes of Effective Security Governance, Benefits of Good Governance **Roles and Responsibilities:** The Board of Directors, Executive Management, Security Steering Committee, The CISO **Strategic Metrics:** Governance Objectives	**CO1,CO2**
II	**Information Security Outcomes:** Strategic Alignment, Risk Management, Business Process Assurance/Convergence, Value Delivery, Resource Management, Resource Management **Security Governance Objectives:** Security Architecture, CobiT, Capability Maturity Model	**CO1, CO3**
III	**Risk Management Objectives:** Risk Management Responsibilities, Managing Risk Appropriately, Determining Risk Management Objectives **Current State:** Current State of Security, Current State of Risk Management, Gap	**CO1,CO2**

	Analysis—Unmitigated Risk Practical Technical Scenarios(Ptss), DrivesCobit5, Framework Principles.	
IV	**Developing a Security Strategy:** Failures of Strategy, Attributes of a Good Security, Strategy Resources, Strategy Constraints, Sample Strategy Development **Implementing Strategy:** Action Plan Intermediate Goals , Action Plan Metrics, Reengineering, Inadequate Performance, Elements of Strategy	**CO1,CO4**
V	**Security Program Development Metrics:** Information Security Program Development Metrics, Program Development Operational Metrics **Information Security Management Metrics:** Management Metrics, Security Management Decision Support Metrics, CISO Decisions, Information Security Operational Metrics	**CO1,CO4**

Learning Resources	
Text Books	
1.	Information Security Governance A Practical Development and Implementation Approach KragBrotby, Wiley A John Wiley & Sons, Inc., Publication
References	
1.	Alan Calder, Steve G.Watkins, "Information Security Risk Management for ISO27001/ISO27002", itgp, 2010.
e-Resources and other Digital Material	
EBOOKS	
1.	https://www.youtube.com/watch?v=0yWt82rlC3o
2.	https://www.coursera.org/lecture/cyber-security-domain/information-security-governance-and-risk-management-FLyKS

PVP SIDDHARTHA INSTITUTE OF TECHNOLOGY, KANURU, VIJAYAWADA
(AUTONOMOUS)
INFORMATION TECHNOLOGY

SCALA PROGRAMMING
(Honors)

Course Code	20IT6501	**Year**	III	**Semester**	I
Course Category	Honors	**Branch**	IT	**Course Type**	Theory
Credits	4	**L-T-P**	4-0-0	**Prerequisites**	Java Programming
Continuous Internal Evaluation :	30	**Semester End Evaluation:**	70	**Total Marks:**	100

Course Outcomes		
Upon Successful completion of course, the student will be able to:		
CO1	Understand the fundamental concepts of basic object oriented programming in scala.	L2
CO2	Apply the knowledge of functional programming concepts to develop applications.	L3
CO3	Analyze and the behavior of programs involving fundamental programming concepts in Scala.	L3
CO4	Apply object-oriented concepts to design and use of Scala in a variety of technologies and on different platforms.	L3

Syllabus		
Unit No	**Contents**	**Mapped CO**
I	**Scala:** Introduction, Scala Environment, Scala Shell, Scala ID, Implementing the Object **Scala Building Blocks:** Introduction, Apps and Applications, Basics of the Language **Scala Classes**: Introduction, Classes, Case Classes **Scala Methods**: Introduction, Method Definitions, Named Parameters	**CO1**
II	**Classes, Inheritance and Abstraction**: Introduction, Inheritance Between Types, Inheritance Between Classes, Restricting a Subclass, Abstract Classes, The Super Keyword, Scala Type Hierarchy, Polymorphism **Objects and Instances**: Introduction, Singleton Objects, Companion Objects **Value Classes**: Introduction, Value Classes, Simple Value Type Example,	**CO1,CO2**
III	**Scala Constructs**: Introduction, Numbers and Numeric Operators, Characters and Strings, Assignments, Variables, Messages and Message Selectors, Control and Iteration **Traits**: Introduction, Abstract Trait Members, Dynamic Binding of Traits, Sealed Traits, Marker Traits **Arrays:** Introduction, Arrays, Creating Square Arrays, Looping Through Arrays **Tuples**: Introduction, Tuple Characteristics, classes, Creating a Tuple,	**CO1,CO3**
IV	**Functional Programming in Scala**: Introduction, Scala as a Functional Language, Defning Scala Functions **Scala Collections Framework**: Introduction, Scala Collections **Immutable Lists and Maps**: Introduction, the Immutable List Collection	**CO1,CO4**
V	**Scala and JDBC Database Access**: Introduction, Working with JDBC, The Database Driver, Registering Drivers, Setting Up MySQL, Setting Up the Database **GUIs in Scala Swing**: Introduction, Windows as Objects, Windows in Scala, Scala Swing, Scala Swing Packages, Swing Scala Worked Examples **Scala& Java Interoperability**: Introduction, a Simple Example, Inheritance, Issues, Functions	**CO1,CO4**

Learning Resources	
Text book:	
1	A Beginner’s Guide to Scala, Object Orientation and Functional Programming, Second Edition John Hunt, Midmarsh Technology Ltd, Bath, Wiltshire Springer publications
References :	
1	Functional Programming in Scala by Paul Chiusano, RunarBjarnason ,MEAP Edition Manning Early Access Program ,version 10
e-Resources and other Digital Material	
1	https://www.tutorialspoint.com/scala/index.htm

PVP SIDDHARTHA INSTITUTE OF TECHNOLOGY, KANURU, VIJAYAWADA
(AUTONOMOUS)
INFORMATION TECHNOLOGY

SOFTWARE DESIGN AND SYSTEM INTEGRATION

(Honors)

Course Code	20IT6501	**Year**	III	**Semester**	I
Course Category	Honors	**Branch**	IT	**Course Type**	Theory
Credits	4	**L-T-P**	4-0-0	**Prerequisites**	**Software Engineering**
Continuous Internal Evaluation :	30	**Semester End Evaluation:**	70	**Total Marks:**	100

Course Outcomes		
Upon successful completion of the course, the student will be able to:		
CO1	Understand basic concepts, methods and technologies related to system integration	L2
CO2	Identify commonly used tools for integrating information systems, describing the benefits of using each.	L2
CO3	Implement alternative strategies for systems integration.	L3
CO4	Analyze the problem and design feasible integration solutions to address the problem.	L3

Syllabus		
Unit No	**Contents**	**Mapped CO**
I	**Introduction:** Software and Systems Integration Methods, Program and Project Planning, Systems Design, Software Requirements, Software Design/Development Software Implementation, Software Integration, Software and Systems Integration, Software Sub contractor, Software and Systems Integration Delivery, Product Evaluation Program and Project Planning: Introduction, Program, Project, Planning	CO1,CO2
II	**Systems Design**: Introduction, Definition of System Design, System Engineering Plan, Software Architecture Evaluation Software Requirements: Introduction, Definition of Software Requirements, Requirements Documentation, Requirements Documentation, Released Software Requirements	CO1, CO2, CO4
III	**Software Design**: Introduction, Development Plan, Software Design Decisions, Peer Reviews, Software Design/Development Suggestions Software Implementation: Introduction, Configuration Management, Configuration Management Tools, Software Media and Data, Future Trends	CO1, CO3,CO4

IV	**Software Integration**: Introduction, Software Integration Strategy, Development Facility, Software Integration Setup, Software Integration Log, Software Test Completion, Integration Verification and Validation, Configuration Reviews and Audits	CO1,CO4
V	**Software and Systems Integration**: Introduction, Software and Systems Integration Plan, Software and Systems Integration Facility, Integration Setup, Formal Engineering Build, Test Team, Quality Participation in Software and Systems Integration, Risk Management Systems/Software Design, Continuous Integration	CO1,CO4

Learning Resources	
Text Books	
1.	Effective methods for Software and Systems Integration BoydL.Summers,,CRC,2013
References :	
1	Enterprise Integration by Fred A. Cummins, John Wiley and Sons 2002
2	Wiley] Enterprise Application Integration: A Wiley Tech Brief, by William A. Ruh, Francis X. Maginnis and William J. Brown, John Wiley & Sons © 2001
e-Resources and other Digital Material	
1	https://nptel.ac.in/courses/106108102

PVP SIDDHARTHA INSTITUTE OF TECHNOLOGY, KANURU, VIJAYAWADA
(AUTONOMOUS)
INFORMATION TECHNOLOGY

MACHINE LEARNING TECHNIQUES

Course Code	20IT3601	**Year**	III	**Semester**	II
Course Category	PC	**Branch**	IT	**Course Type**	Theory
Credits	3	**L-T-P**	3-0-0	**Prerequisites**	Linear algebra, Statistics and Probability.
Continuous Internal Evaluation :	30	**Semester End Evaluation:**	70	**Total Marks:**	100

Course Outcomes		
Upon successful completion of the course, the student will be able to		
CO1	Understand the basic concepts of machine learning.	**L2**
CO2	Apply machine learning techniques on appropriate problems.	**L3**
CO3	Apply Evaluation, hypothesis tests and compare learning techniques for various problems.	**L3**
CO4	Analyze real time problems in different areas and solve using Reinforcement learning technique.	**L4**

Contribution of Course Outcomes towards achievement of Program Outcomes & Strength of correlations (3:Substantial, 2: Moderate, 1:Slight)

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	3												3	3
CO2	3			3									3	3
CO3		3											3	3
CO4		3		3									3	3

Syllabus		
Unit No.	**Contents**	**Mapped CO**
I	**Introduction:** What Is Machine Learning?, Examples of Machine Learning Applications - Learning Associations, Classification, Regression, Unsupervised learning, Reinforcement learning. [TB-1]	**CO1,C02**
II	**Supervised Learning: Regression:** Introduction to Linear Regression and Multiple Linear Regression, KNN. Measuring regression model performance - R Square, Mean Square Error(MSE),Root Mean Square Error(RMSE), Mean Absolute Error(MAE) **Classification**: Support vector machine- Characteristics of SVM, Linear SVM, Naive Bayes Classifier, KNN classifier, Logistic Regression. [TB-2] **Measuring Classifier Performance:** Precision, Recall, Confusion Matrix. [TB1]	**CO1,CO2,CO3**
III	**Combining Multiple Learners**– Model Combination schemes, voting, Bagging, Boosting. [TB1] **UnSupervised Learning:** K-Means, Expectation Maximization Algorithm, supervised learning after clustering, spectral clustering, choosing number of clusters.[TB-1]	**CO1,CO2,CO3**
IV	**Multilayer Perceptrons:** The Perceptron, Training a Perceptron, Learning Boolean Functions, Multilayer Perceptrons, MLP as a Universal Approximator, Back propagation Algorithm, Training Procedures, Dimensionality Reduction, Learning Time. [TB-1]	**CO1,CO2,CO3**
V	**Reinforcement Learning**: Single State Case: K-Armed Bandit, Elements of Reinforcement learning, Model based Learning, Temporal Difference learning, Generalizing from examples. [TB-1]	**CO1,CO3,CO4**

Learning Resources
Text Book
1.Introduction to Machine Learning, Ethem Alpaydin, Second Edition, 2010, Prentice Hall of India. 2.Introduction to Data Mining, Tan, Vipin Kumar, Michael Steinbach, 9th Edition, 2013, Pearson.
References
1. Machine Learning by Tom M. Mitchell, International Edition 1997, McGraw Hill Education. 2. Machine Learning, Anuradha Srinivasaraghavan, and Vincy Joseph, Kindle Edition, 2020, WILEY. 3.Machine Learning a Probabilistic Perspective, Kevin P Murphy & Francis Bach, First Edition, 2012, MIT Press. 4. “Deep Learning”, Ian Goodfellow, Yoshua Bengio, Aaron Courville, 2016, MIT Press.
e-Resources and other Digital Material
1.https://www.coursera.org/learn/machine-learning 2.https://nptel.ac.in/courses/106/106/106106139/

PVP SIDDHARTHA INSTITUTE OF TECHNOLOGY, KANURU, VIJAYAWADA
(AUTONOMOUS)
INFORMATION TECHNOLOGY

MODERN WEB APPLICATIONS

Course Code	20IT3602	**Year**	III	**Semester**	II
Course Category	PC	**Branch**	IT	**Course Type**	Theory
Credits	3	**L-T-P**	3-0-0	**Prerequisites**	-
Continuous Internal Evaluation :	30	**Semester End Evaluation:**	70	**Total Marks:**	100

Course Outcomes		**Blooms Taxonomy Level**
Upon Successful completion of course, the student will be able to		
CO1	Understand core concepts of both the frontend and backend technologies.	**L2**
CO2	Apply Express JS, React JS which are used extensively to handle both the Front-end and Back-end development processes.	**L3**
CO3	Construct server side web applications by applying Node.js elements	**L3**
CO4	Build applications for accessing data using MongoDB	**L3**

Contribution of Course Outcomes towards achievement of Program Outcomes & Strength of correlations (3:Substantial, 2: Moderate, 1:Slight)

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO 1**	**PSO 2**
CO1	3											3	3	3
CO2			3									3	3	3
CO3			3									3	3	3
CO4			3									3	3	3

Syllabus

Unit No	Contents	Mapped CO
I	**Introduction:** MERN, MERN Components, Serverless Hello World Application, ES6, DOM, JSON, Installation. **React Basics:** Introduction, Virtual DOM, Components in React, Tradeoffs, using JSX , React Project Structure, State, Component Communication, One-way data flow, Rendering and Life Cycle methods.	**CO1,CO2**
II	Updating React Components, Creating a Newsfeed. **Forms, Libraries & Routing:** Working with Forms &Third Party libraries, Routing. **Redux:** Application Architecture, Integrating Redux with React.	**CO1,CO2**
III	**Node.js:** Getting Started with Node.js, Using Events, Listeners, Timers, and Callbacks in Node.js, Handling Data I/O in Node.js. Accessing the File System from Node.js, Implementing HTTP Services in Node.js.	**CO1,CO3**
IV	**Express with Node.js**, Routes, Request and Response objects, Template engine. Understanding middleware, Query middleware, Serving static files, Handling POST body data, Cookies, Sessions, Authentication	**CO1,CO3**
V	**MongoDB:** Understanding NoSQL and MongoDB, Getting Started with MongoDB, Getting Started with MongoDB and Node.js, Manipulating MongoDB Documents from Node.js, Accessing MongoDB from Node.js.	**CO1,CO3, CO4**

Learning Resources

Textbooks

1) React in Action, Mark Tielens Thomas, Manning Publications, 2018, ISBN:978-1617293856 , First Edition
2) Node.js, MongoDB and Angular Web Development, Brad Dayley, Brendan Dayley Caleb Dayley, 2/e, Pearson Edu., Inc. 2018, ISBN: 978-0-13-465553-6

References

1) Pro MERN Stack, Vasan Subramanian, 2/e, Apress, 2019, ISBN: 978-1-4842-4390-9
2) Full Stack React – The Complete Guide to ReactJS and Friends, Anthony Accomazzo, Nate Murray, Ari Lerner, Clay Allsopp, David Guttman, and Tyler McGinnis, 2020, \newline,
3) Node.js in Action, Mike Cantelon, Marc Harter, T.J. Holowaychuk& Nathan Rajlich, Manning Publications, 2014, ISBN: 9781617290572.
4) MongoDB in Action, 2/e, Kyle Banker, Peter Bakkum, Shaun Verch, Douglas Garrett & Tim Hawkins, Manning Publications, 2016, ISBN: 9781617291609.

e-Resources and other Digital Material

1. The-Complete-Beginners-Guide-to-React_Dyrr.pdf (html5hive.org)
2. React for Beginners – A React.js Handbook for Front End Developers (freecodecamp.org)
3. How To Code in React.js (digitalocean.com)
4. The-Complete-Beginners-Guide-to-React_Dyrr.pdf (html5hive.org)
5. Nodejs Programming By Example - Google Play Books

PVP SIDDHARTHA INSTITUTE OF TECHNOLOGY, KANURU, VIJAYAWADA(AUTONOMOUS)
INFORMATION TECHNOLOGY

INTERNET OF THINGS

Course Code	20ES1602	**Year**	III	**Semester**	II
Course Category	ES	**Branch**	IT	**Course Type**	Theory
Credits	3	**L-T-P**	3-0-0	**Prerequisites**	-
Continuous Internal Evaluation:	30	**Semester End Evaluation:**	70	**Total Marks:**	100

Course Outcomes		
Upon successful completion of the course, the student will be able to		
CO1	**Summariz**e the genesis and impact of IoT applications, architectures in real world.	**L2**
CO2	**Apply** diverse methods in deploying smart objects and connecting them to network.	**L3**
CO3	**Construct** simple applications using Arduino.	**L3**
CO4	Identify and S**elect** different protocols required for communication in the IoT system.	**L3**
CO5	**Analyze** and develop a solution for a given application using APIs.	**L4**

Contribution of Course Outcomes towards achievement of Program Outcomes & Strength of correlations (3:Substantial, 2: Moderate, 1:Slight)

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	2	3		3							3	2	
CO2	2	2	2	3	3							3	3	2
CO3	3	2	2	2	3							2	3	3
CO4	3	3	2		2							3	2	2
CO5	3	3	3	3		2						2	2	3
Average*	3	3	3	3	3	2						3	3	3

Syllabus		
Unit No.	**Contents**	**Mapped CO**
I	Genesis of IoT, IoT and Digitization, IoT Impact-Connected roadways, Smart connected buildings, Convergence of IT and IoT, IoT Challenges, Comparing IoT Architectures - OneM2M IoT Architecture and IoT WF Architecture, A Simplified IoT Architecture	CO1,CO2
II	Smart Objects: The Things in IoT- Sensors, Actuators, and Smart Objects, Sensor Networks-Advantages and Disadvantages, Communications Criteria-Range, Frequency bands, Power consumption, Topology, IoT Access Technologies- IEEE 802.15.4,IEEE 1901.2a,IEEE 802.11ah (only Standardization and Alliances, Physical Layer, MAC Layer and Topology)	CO1, CO2
III	Embedded Computing Basics- Microcontrollers, System-on-Chips, Choosing Your Platform, Arduino- Developing on the Arduino, Some Notes on the Hardware, Openness	CO1, CO3
IV	Communication in the IoT: Internet Principles, Internet Communications: An Overview- IP, TCP, The IP Protocol Suite (TCP/IP), UDP, IP Addresses- DNS, Static IP Address Assignment, Dynamic IP Address Assignment, IPv6, MAC Addresses, TCP and UDP Ports- An Example: HTTP Ports, Other Common Ports, Application Layer Protocols- HTTP, HTTPS: Encrypted HTTP, Other Application Layer Protocols.	CO1, CO4
V	Prototyping Online Components: Getting Started with an API, Writing a New API, Real-Time Reactions, Other Protocols.	CO1, CO5

Learning Resources

Text Books

1. Adrian McEwen, Hakim Cassimally - Designing the Internet of Thing Wiley Publications, 2012.
2. David Hanes, Gonzalo Salgueiro, Patrick Grossetete, Robert Barton, Jerome Henry,"IoT Fundamentals: Networking Technologies, Protocols, and Use Cases for the Internet of Things, 1stEdition, Pearson Education (Cisco Press Indian Reprint). (ISBN: 978-9386873743)

Reference Books

1. Arshdeep Bahga, Vijay Madisetti - Internet of Things: A Hands-On Approach, Universities Press, 2014
2. Srinivasa K G, Internet of Things, CENGAGE Leaning India, 2017

e-Resources &amp other digital material

1.https://nptel.ac.in/courses/106/105/106105166/

PVP SIDDHARTHA INSTITUTE OF TECHNOLOGY, KANURU, VIJAYAWADA(AUTONOMOUS)
INFORMATION TECHNOLOGY

CYBER FORENSICS
(Professional Elective – II)

Course Code	20IT4601A	**Year**	III	**Semester**	II
Course Category	PE-II	**Branch**	IT	**Course Type**	Theory
Credits	3	**L-T-P**	3-0-0	**Prerequisites**	-
Continuous Internal Evaluation:	30	**Semester End Evaluation:**	70	**Total Marks:**	100

Course Outcomes		**Blooms Taxonomy Level**
Upon successful completion of the course, the student will be able to		
CO1	Understand the basic terminology of cybercrimes	**L2**
CO2	Apply a number of different computer forensic tools to a given scenario	**L3**
CO3	Understand the basics of computer forensics	**L2**
CO4	Analyze and validate digital evidence data	**L3**
CO5	Analyze acquisition methods for digital evidence related to system security	**L3**

Contribution of Course Outcomes towards achievement of Program Outcomes & Strength of correlations (3:Substantial, 2: Moderate, 1:Slight)

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1				3	3	3						3		
CO2				3	3	3						3		
CO3				3	3	3						3	3	3
CO4				3	3	3						3	3	3
CO5				3	3	3						3	3	3

Syllabus		
Unit No	**Contents**	**Mapped CO**
I	**Introduction To Cybercrime**: Introduction, Role of Electronic Communication Devices and Information and Communication Technologies in Cybercrime, Types of Cybercrime, Cybercrime against Individuals, Property, Nation, Crimes associated with mobile electronic communication devices, classification of cybercriminals, Execution of cybercrime, tools used in cybercrime, factors influencing cybercrime, challenges to cybercrime, strategies to prevent cybercrimes.	**CO1**
II	**Classification of Cybercrime:** Introduction, Cybercrime against individuals, cybercrime against property, cybercrime against nation. **Cybercrime the present and the future:** Introduction to cyber war, crypto currency, bitcoin, ethereum, comparison between bitcoin and ethereum, blockchain, ransomeware, deep web and dark web and its challenges.	**CO1**
III	**Introduction to cyber forensics**: Interrelation among cybercrime, cyber forensics, and cyber security, cyber forensics, disk forensics, network forensics, wireless forensics, database forensics, malware forensics, mobile forensics, gps forensics ,email forensics, memory forensics, building forensic computing lab, incident and incident handling, computer security incident	**CO2,CO3**
IV	**Digital Evidence**: Introduction to digital evidence and evidence collection procedure, sources of evidence, digital evidence from standalone computers/electronic communication devices. **Cyber forensics-The present and Future:** Forensic tools, cyber forensic suite, Drive Imaging and validation tools, Forensic tools for integrity verification and hashing, data recovery, ram analysis, analysis of registry, encryption/decryption, analysing network, mobile devices, email analysis, Need for computer forensic investigators, career prospects for forensic investigators.	**CO2,CO4**
V	**Acquisition and handling of digital evidence:** preliminaries of electronic or digital evidence, acquisition and seizure of evidence, chain of custody and digital evidence collection form, fourth amendment and seizure, acquisition of computer and electronic evidence. acquisition of evidence form optical and removal media, digital cameras.	**CO4,CO5**

Learning Resources
Text book
1.Dejay, Murugan, Cyber Forensics Oxford university press India Edition, 2018.
References
1.CEH official Certified Ethical Hacking Review Guide, Wiley India Edition, 2015.
e-Resources and other Digital Material
1.http://www.cyberforensics.in/ 2.https://evestigate.com/computer-forensics-links/

PVP SIDDHARTHA INSTITUTE OF TECHNOLOGY, KANURU, VIJAYAWADA(AUTONOMOUS)
INFORMATION TECHNOLOGY

CLOUD COMPUTING

(Professional Elective – II)

Course Code	20IT4601B	**Year**	III	**Semester**	II
Course Category	PE-II	**Branch**	IT	**Course Type**	Theory
Credits	3	**L-T-P**	3-0-0	**Prerequisites**	CN
Continuous Internal Evaluation:	30	**Semester End Evaluation:**	70	**Total Marks:**	100

Course Outcomes		**Blooms Taxonomy Level**
Upon Successful completion of course, the student will be able to		
CO1	Understanding Fundamental Concepts and Models of Cloud Computing and Cloud Enabling Technologies, Infrastructure Mechanisms	L2
CO2	Determine Cloud Infrastructure Mechanisms	L3
CO3	Determine different Cloud Maintenance strategies	L3
CO4	Analyze Cloud Architectures and Delivery Model	L4

Contribution of Course Outcomes towards achievement of Program Outcomes & Strength of correlations (3:Substantial,2:Moderate,1:Slight)

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO1**	**PSO 2**
CO 1	3												2	
CO 2	3			3									2	
CO 3	3			3									2	
CO 4	3	3											2	

Syllabus		
Unit	**Contents**	**Mapped COs**
I	**Understanding Cloud Computing**: Cloud origins and influences, basic concepts and terminology, goals and benefits, risks and challenges. **Fundamental Concepts and Models:** Roles and boundaries, cloud characteristics, cloud delivery models, cloud deployment models	**CO1**
II	**Cloud Enabling Technology:** Data center technology, virtualization technology, web technology, multitenant technology, service technology.	**CO1**
III	**Cloud Infrastructure Mechanisms:** Logical network perimeter, virtual server, cloud storage device, cloud usage monitor, resource replication	**CO1, CO2**
IV	**Specialized Cloud Mechanisms:** Automated Scaling Listener, Load Balancer, SLA Monitor, Pay-Per- Use Monitor, Audit Monitor, Failover System, Hypervisor, Resource Cluster, Multi-Device Broker, State Management Database. Case Studies.	**CO3**
V	**Fundamental Cloud Architectures:** Workload distribution architecture, resource pooling architecture, dynamic scalability architecture, elastic resource capacity architecture, service load balancing architecture, cloud bursting architecture, elastic disk provisioning architecture ,redundant storage architecture. **Cloud Delivery Model Considerations:** The cloud provider perspective: Building IaaS environments, equipping PaaS environments, optimizing SaaS environments, the cloud consumer perspective: Working with IaaS environments, working with PaaS environments, working with SaaS services.	**CO1, CO4**

Learning Recourses
Text Books
1.Thomas Erl, Ricardo Puttini, Zaigham Mahmood, Cloud Computing: Concepts, Technology& Architecture, Prentice Hall,2013.
References
1. John W.Ritting house, James F.Ransome, Cloud Computing: Implementation, Management and Security, CRC Press,2012. 2. Anthony T.Velte, Toby JVelte Robert Elsenpeter, Cloud Computing a practical approach, McGrawHill,2010. 3. MichaelMiller,CloudComputing:WebbasedApplicationsThatChangetheWay You Work and Collaborate Online, QuePublishing,2008.
e-Resources& other digital material
NPTELVIDEOLECTURES

PVP SIDDHARTHA INSTITUTE OF TECHNOLOGY, KANURU, VIJAYAWADA(AUTONOMOUS)
INFORMATION TECHNOLOGY

OBJECT ORIENTED SOFTWARE ENGINEERING
(Professional Elective – II)

Course Code	20IT4601C	**Year**	III	**Semester**	II
Course Category	PE-2	**Branch**	IT	**Course Type**	Theory
Credits	3	**L-T-P**	3-0-0	**Prerequisites**	SE
Continuous Internal Evaluation :	30	**Semester End Evaluation:**	70	**Total Marks:**	100

Course Outcomes		**Blooms Taxonomy Level**
Upon Successful completion of course, the student will be able to		
CO1	Understand the fundamental phases of software development and the Principles underlying Object-Oriented software design.	L2
CO2	Employ formal methods and different roles played to produce effective software designs as solutions to specific tasks.	L3
CO3	Develop structured sets of simple user-defined classes using Object-Oriented principles to achieve overall programming goals.	L3
CO4	Develop error identification and testing strategies for code Development.	L3
CO5	Understand modeling for a given problem for better development of the software product to have a high quality	L3

ContributionofCourseOutcomestowardsachievementofProgramOutcomes&Strengthofcorrelations(3:Substantial,2:Moderate,1:Slight)

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	3													2
CO2	3		3											2
CO3	3				2									2
CO4	3					2								2
CO5	3					2				3				2

Syllabus

Unit No	**Contents**	**Mapped CO**
I	**Software engineering**: software related problems, software engineering, concepts, development activities,	**CO1**

	Project communications: Project communication, modes, mechanisms And activities.	
II	**Requirements**: Requirements elicitation, concepts , activities and Managing requirements elicitation. **Analysis**: Analysis overview, concepts, activities and managing analysis	**CO2**
III	**System design**: Design overview, concepts, activities and managing System design. **Object design**: Object Design Overview, concepts, activities and managing object design	**CO3**
IV	**Rationale management**: Rational overview, concepts, activities and Managing rationale **Testing:** Testing overview, concepts, activities and managing testing.	**CO4**
V	**Software configuration management**: Configuration management overview, concepts, activities and managing configuration management **Project management**: project management overview, concepts, activities and managing project management models and activities.	**CO5**

Learning Recourses
Text Books
1.Object-oriented Software engineering: Conquering complex and changing systems, Bernd Bruegge and AllenH.Dutoit .Pearson Education Asia.,First edition.
References
1.Object–oriented software engineering: Practical software development using UML and Java Timothy C.lethbridge and Robert Langaniere Mcgraw–Hill Higher Education.
e-Resources& other digital material
NPTEL VIDEO LECTURES

PVP SIDDHARTHA INSTITUTE OF TECHNOLOGY, KANURU, VIJAYAWADA(AUTONOMOUS)
INFORMATION TECHNOLOGY

ARTIFICIAL INTELLEGENCE AND EXPERT SYSTEMS
(Professional Elective – II)

Course Code	20IT4601D	**Year**	III	**Semester**	II
Course Category	PE -2	**Branch**	IT	**Course Type**	Theory
Credits	3	**L-T-P**	3-0-0	**Prerequisites**	
Continuous Internal Evaluation:	30	**Semester End Evaluation:**	70	**Total Marks:**	100

Course Outcomes		**Blooms Taxonomy Level**
Upon Successful completion of course, the student will be able to		
CO1	Know the challenges and concepts of AI.	L2
CO2	Solve problems using heuristics search algorithms	L3
CO3	Transform knowledge into rules.	L3
CO4	Demonstrate Symbolic reasoning under uncertainty	L3
CO5	Acquainted with expert systems.	L3

Contribution of Course Outcomes towards achievement of Program Outcomes & Strength of correlations (3:Substantial,2:Moderate,1:Slight)

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	3	3											3	3
CO2	3	3											3	3
CO3	3	3											3	3
CO4		3					3						3	3
CO5	3	3											3	3

Syllabus		
Unit No	**Contents**	**Mapped CO**
I	**What is AI**: The AI Problems, What is an AI Techniques, Criteria for Successes? Problems and problem spaces and Search: Problem as a state space search, Production systems, Problem Characteristics, Production system characteristics.	**CO1**
II	**Heuristic search technique**: Generate and test, Hill climbing, Best First search, Problem reduction, Constraint satisfaction, Means ends analysis.	**CO2**
III	**Knowledge Representation issues**: Representations and mappings. Predicate logic: Representing simple facts in logic, Resolution. Representing knowledge using rules: Procedural knowledge Vs Declarative knowledge, Forward Vs Backward reasoning, matching.	**CO3**
IV	**Symbolic reasoning under uncertainty**: Introduction to Non monotonic reasoning, Implementation in DFS and BFS. Weak, strong slot and filler structures: Semantic nets, Frames, Conceptual dependency, Scripts.	**CO4**
V	**Game playing**: The min-max search procedure, adding alpha-beta cutoffs. Planning: Goal stack planning, Hierarchical planning. Expert Systems: Expert system shells, Knowledge acquisition. Perception and action: Perception, action, Robot architecture.	**CO5**

Learning Resources

Text Books

1. Artificial Intelligence,2nd Edition, E.Rich and K.Knight(TMH).

References

1. Artificial Intelligence and Expert Systems–Patters on PHI
2. Expert Systems Principles and Programming-Fourth Edn, Giarrantana/Riley, Thomson
3. PROLOG Programming for Artificial Intelligence. IvanBratka-Third Edition–Pearson Education.

e-Resources& other digital material

http://www.jntuk-coeerd.in/

http://nptel.ac.in/video.php?subjectId=106105079

http://nptel.iitk.ac.in/courses/Webcourse-contents/IIT%20Kharagpur/Artificial%20intelligence/New_index1.html

DATA VISUALIZATION

(Professional Elective – II)

Course Code	20IT4601E	**Year**	III	**Semester**	II
Course Category	PE - 2	**Branch**	IT	**Course Type**	Theory
Credits	3	**L-T-P**	3-0-0	**Prerequisites**	
Continuous Internal Evaluation:	30	**Semester End Evaluation:**	70	**Total Marks:**	100

Course Outcomes		**Blooms Taxonomy Level**
Upon Successful completion of course, the student will be able to		
CO1	Understand the key techniques and theory behind data visualization and various Data visualization tools.	L2
CO2	Use effectively the various visualization structures (like tables, spatial data, tree and network etc.)	L3
CO3	Evaluate information visualization systems and other forms of visual presentation for their effectiveness	L4
CO4	Design and build data visualization systems	L4

Contribution of Course Outcomes towards achievement of Program Outcomes & Strength of correlations(3:Substantial,2:Moderate,1:Slight)

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	3												3	3
CO2			3										3	3
CO3		3											3	3
CO4			3										3	3

Syllabus

Unit No	Contents	Mapped CO
I	**Introducing Visualization and Tableau:** Why Data Visualization? What can data Visualization help with? An introduction to Visualization, Positioning of Tableau, Tableau product line, File types in Tableau. Working with single and multiple data sources: Desktop Architecture, Tableau environment, Connect to a file, connect to a server, meta data grid, Joins, custom SQL, Data blending and data extracts	**CO1**
II	**Simplifying and sorting your data:** Filtering, sorting, groups, Difference between a set and a group Measure Names and Measure Values: Why are measure names and measure values required?	**CO1, CO3**
III	**Table Calculations:** What is a table calculation? Running total of sales, Profitability as percent of total, Moving average, rank, LOD(level of detail), percentile, year over year growth Customizing Data: Number Functions, string functions, logical functions, date functions, aggregate functions, table calculation functions	**CO1, CO2, CO3**
IV	**Statistics:** Why use statistics? What is statistics? Descriptive statistics, inferential statistics, few terms in statistics, Why do we use inferential statistics? Why do we use descriptive statistics? Five magic number summary, spread of data, Box plot, statistical tools in Tableau, trend lines and forecasting Chart Forms: Pie chart, tree maps, Heat Map, Highlight Table, Line Graph, Stacked Bar Chart, Gantt Chart, Scatter Plot, Histogram, Word Cloud	**CO1, CO2, CO4**
V	**Advanced visualization:** waterfall charts, bump charts, Bullet Graph Dashboard and stories: Why use a dashboard? What is a dashboard? Creating a dashboard, dashboard actions, creating a story, what is a story?	**CO1, CO2, CO4**

Learning Resources

Text Books

1. Seema Acharya, Subhashini Chellappan, Pro Tableau- A step-by-step guide, Apress 2017,Ist Edition

References

1. Andy Kirk,Data Visualization: a successful design process, Paperback , 2012

e-Resources& other digital material

[1] Prof. Han-Wei Shen Introduction to Data Visualization, http://web.cse.ohiostate.edu/~shen.94/5544/
[2]University of Illinois at Urbana-Champaign https://www.coursera.org/learn/datavisualization

INTRODUCTION TO DATA MINING

(Open Elective - II)

Course Code	20IT2601A	**Year**	III	**Semester**	II
Course Category	OE - 2	**Branch**	Offered by IT	**Course Type**	Theory
Credits	3	**L-T-P**	3-0-0	**Prerequisites**	
Continuous Internal Evaluation:	30	**Semester End Evaluation:**	70	**Total Marks:**	100

Course Outcomes		**Blooms Taxonomy Level**
Upon Successful completion of course, the student will be able to		
CO1	Understand the basic principles, process and techniques of data mining.	L2
CO2	Use pre-processing techniques on different datasets.	L3
CO3	Apply techniques and algorithms for Mining frequent patterns, classifying and clustering data.	L3
CO4	Analyze the data for mining frequent patterns, associations, classification and outlier detection in a real scenario.	L4

Contribution of Course Outcomes towards achievement of Program Outcomes & Strength of correlations(3:Substantial,2:Moderate,1:Slight)

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	3												3	
CO2	3			3									3	
CO3	3			3									3	3
CO4	3	3											3	3

Syllabus		
Unit No	**Contents**	**Mapped CO**
I	**Introduction:** What is data mining? What kinds of data can be mined? What kinds of pattern can be mined? Which technologies are used? Which kinds of applications are targeted?, Major Issues in Data Mining.	CO1
II	**Getting to Know Your Data:** Data objects and Attribute Types, Basic statistical descriptions of data, Measuring Data Similarity and Dissimilarity. Data Preprocessing: An overview, Data Cleaning, Data integration, Data Reduction, Data Transformation and Discretization.	CO1 CO2
III	**Mining frequent patterns, Associations and Correlations-** Basic Concepts, Frequent itemset Mining methods- Apriori Algorithm, Generating association rules from frequent itemsets, improving the efficiency of Apriori.	CO1 CO3 CO4
IV	**Classification:** Basic Concepts – Basic concepts, Decision Tree Induction, Rule Based Classification, Model evaluation and Selection.	CO1 CO3 CO4
V	**Cluster Analysis:** Basic Concepts and Methods- Cluster Analysis, partitioning methods, Hierarchical Methods and evaluation of Clustering	CO1 CO3 CO4

Learning Resources

Text Books

1. Jiawei Han and Micheline Kamber, "Data Mining Concepts and Techniques" Third Edition, Elsevier, 2012.

References

1. Michael Steinbach, Vipin Kumar, Pang-Ning Tan, Introduction to data mining, First Edition, Addison Wesley, 2006
2. Margaret H. Dunham, Data Mining Introductory and Advanced Topics, 1/e, Pearson Publishers, 2006

e-Resources& other digital material

1. https://www.coursera.org/lecture/code-free-data-science/introduction-to-data-mining-hbb2V
2. https://onlinecourses.swayam2.ac.in/cec19_cs01/preview material

ECOLOGY AND ENVIRONMENT

(Open Elective - II)

Course Code	20CE2601A	**Year**	III	**Semester**	II
Course Category	OE - 2	**Branch**	Offered by CE	**Course Type**	Theory
Credits	3	**L-T-P**	3-0-0	**Prerequisites**	-
Continuous Internal Evaluation:	30	**Semester End Evaluation:**	70	**Total Marks:**	100

Course Outcomes		**Blooms Taxonomy Level**
Upon Successful completion of course, the student will be able to		
CO1	**Integrate** information related to structure and functions of ecological units.	L3
CO2	**Analyze** and communicate the concepts of environment.	L4
CO3	**Analyze** various environmental components and demonstrate using technology.	L4
CO4	**Analyze** and evaluate policies and frame works for welfare of environment & social sustainability.	L4
CO5	**Apply** system concepts for bio-monitoring environmental issues.	L3

Contribution of Course Outcomes towards achievement of Program Outcomes & Strength of correlations(3:Substantial,2:Moderate,1:Slight)

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	2						2					2		2
CO2	2					3	3							3
CO3	3						3	3						3
CO4	2						3							3
CO5	2					2	2					2		2

Syllabus		
Unit No	**Contents**	**Mapped CO**
I	**ECOLOGY:** Introduction – Biosphere, scope, organization and significance. Ecosystem concept- structure &function, Factors affecting ecosystem. Evolution: Natural Selection and its ecological significance. Population parameters- growth regulation, relationships between organisms.	CO1 CO2
II	**NATURAL RESOURCES & MANAGEMENT:** Resource- Definition, category, concept and scarcity of resource. Forests & wild life- Global productivity & human activities (Exploitation). Land Resource- use pattern in India, soil & soil Conservation. Water resource- potentials and use with special reference to India, Concept of Integrated Water Resources Management (IWRM). Remote Sensing and GIS: Applications in conserving resources.	CO1 CO2
III	**ENVIRONMENTAL GEOSCIENCES & COMPUTER APPLICATIONS**: Structure and composition of atmosphere, hydrosphere, lithosphere and biosphere. Scale of meteorology, pressure, temperature, atmospheric stability. Graphical representation of Data, creating Database tables.	CO3
IV	**ENVIRONMENTAL POLICY, EDUCATION AND ETHICS:** Important National policies: National environmental policy, 2006 & National agricultural policy etc. Legislation: Environment Protection Act, 1986.Environmental education: Goals and objectives of environmental education. Environment awareness and action: Role of NGOs in environmental awareness. Environmental movements in India- silent valley movement, Chipko movement, Narmada BachaoAndolan, Environmental movements in the West- Green Peace.	CO4
V	**ENVIRONMENTAL MONITORING AND MANAGEMENT:** Environmental impact analysis and EMP; Analytical approaches and instrumentation in environmental monitoring; Bio-monitoring of air pollution - plants as bio monitors; Bio monitoring of running water pollution. (Software's)Organic Farming and its ecological significance.	CO4 CO5

Learning Resources
Text Books
1) Singh, J.S; Singh, S.P. and Gupta S.R. (2014) Ecology, Environmental Science and Conservation. S. Chand & Company Pvt. Ltd. New Delhi. 2) Sharma, P.D. (2011) Ecology and Environment (11th edition) Rastogi Publication, Meerut. 3) Bharucha, E. (2013) Text Book of Environmental Studies (2nd edition.). Universities Press, Hyderabad.
References
1) Nobel, B.J. and Wright, R.T. (1995) Environmental Science. Prentice Hall. 2) Agarwal, S.K. (1991) Pollution Ecology. Himanshu Publication, Udaipur. 3) S.V.S.Rana, Essentials of Ecology and Environmental Science, Prentice Hall India, New Delhi, 2011.
e-Resources& other digital material
http://nptel.ac.in

MATLAB PROGRAMMING

(Open Elective – II)

Course Code	20EC2601A	**Year**	III	**Semester**	II
Course Category	OE - II	**Branch**	Offered by ECE	**Course Type**	Theory
Credits	3	**L-T-P**	3-0-0	**Prerequisites**	Nil
Continuous Internal Evaluation:	30	**Semester End Evaluation:**	70	**Total Marks:**	100

Course Outcomes	
Upon successful completion of the course, the student will be able to	
CO1	Outline the basic concepts of MATLAB. (L2)
CO2	Develop programs for scientific and mathematical problems. (L3)
CO3	Analyze an engineering system/Problem through graphical representation and numerical analysis. (L4)
CO4	Build optimized code for various applications in Engineering and Technology.(L3)

Mapping of course outcomes with Program outcomes (CO/ PO/PSO Matrix)
Note: 1- Weak correlation 2-Medium correlation 3-Strong correlation
* - Average value indicates course correlation strength with mapped PO

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO1	PSO 2
CO1	2									1			2	2
CO2	3									2			3	3
CO3		2								2			2	2
CO4	3									2			3	3
Average*	**3**	**2**								**2**			**2**	**2**

Syllabus		
Unit No.	**Contents**	**Mapped CO**
I	**Introduction:** Starting MATLAB, Working in command window, Arithmetic operations, Display formats, Elementary Math Built-in functions, Defining scalar variables, useful commands for managing variables, Script files, Examples of MATLAB applications	CO1,CO2
II	**Creating arrays and Mathematical operations with arrays:** Creating 1-dimensional and 2- dimensional arrays, The Transpose operator, Array addressing, using a colon: in addressing arrays, Adding elements to existing variables, Deleting elements, Built in functions for handling arrays, Strings and strings as variables, Addition and Subtraction, Array Multiplication and Division, Element-by-Element operations, using arrays in MATLAB built-in math functions, Built in functions for analysing arrays, Generation of Random Numbers, Examples of MATLAB applications.	CO1,CO2, CO4
III	**Two Dimensional and Three Dimensional Plots:** plot, fplot commands, Formatting a plot, plots with logarithmic axes, error bars, special graphics, Histograms, Polar plots, putting multiple plots on the same page, Multiple figure windows, Examples, Line plots, Mesh and surface plots, plots with special graphics, The view command, Examples of MATLAB applications	CO1,CO2, CO3,CO4
IV	**Programming in MATLAB:** Relational and Logical operators, conditional statements, The switch-case statement, Loops, Nested Loops and Nested conditional statements, The break and continue commands, creating a function file, structure of a function file, Local and Global variables, saving a function file, using a User-defined function, Examples of simple User-defined functions, comparison between script files and function files.	CO1,CO2, CO4
V	**Polynomial, Curve-fitting, Interpolation, Numerical Analysis**: Polynomials, curve fitting, Interpolation, The Basic fitting interface, Examples, solving equation of one variable, Finding minimum or maximum of a function, Numerical integration, ordinary differential equations.	CO2,CO3, CO4

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Learning Resources
Text Books
1. MATLAB: An Introduction with applications – Amos Gilat, Wiley India Pvt. Ltd, 4th Ed., 2012.
Reference Books
1. Getting started with MATLAB – Rudra Pratap, Oxford University Press, 2010 2. MATLAB and SIMULINK for Engineers – Agam Kumar Tyagi, Oxford University Press, 2012.

TV ENGINEERING

Course Code	20EC2601B	Year	III	Semester	II
Course Category	OE - II	Branch	Offered by ECE	Course Type	Theory
Credits	3	L-T-P	3-0-0	Prerequisites	--
Continuous Internal Evaluation:	30	Semester End Evaluation:	70	Total Marks:	100

Course Outcomes	
Upon successful completion of the course, the student will be able to	
CO1	Compare Digital TV transmission standards and performance parameters (L2)
CO2	Analyse channel coding, errors, interferences and modulation techniques for Digital TV(L4)
CO3	Make use of RF amplifiers, modules and systems for Digital TV (L3)
CO4	Identify Transmission lines for Digital TV(L3)
CO5	Test for a Digital TV Transmitter(L4)

Mapping of course outcomes with Program outcomes (CO/ PO/PSO Matrix)
Note: 1- Weak correlation 2-Medium correlation 3-Strong correlation
* - Average value indicates course correlation strength with mapped PO

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	-	-	-	2	1	-	-	-	-	-	-	-	
CO2	-	3	-	-	2	-	-	-	-	-	-	-	-	2
CO3	-	2	-	-	3	-	-	-	-	-	-	-	-	
CO4	-	-	-	-	2	2	-	-	-	-	-	-	-	3
CO5	-	2	-	-	2	-	1	-	-	-	-	-	-	
Average*	2	2	-	-	2	2	1	-	-	-	-	-	-	3

Syllabus

Unit No.	Contents	Mapped CO
I	**Digital Television Transmission Standards**: ATSC terrestrial transmission standard, vestigial sideband modulation, DVB-T transmission standard, ISDB-T transmission standard, channel allocations, antenna height and power, MPEG-2 Performance Objectives for Digital Television: System noise, external noise sources, transmission errors, error vector magnitude, eye pattern, interference, cochannel interference, adjacent channel interference, analog to digital TV, transmitter requirements	CO1, CO2
II	**Channel Coding and Modulation for Digital Television:** Data synchronization, randomization/scrambling, forward error correction, interleaving, inner code, frame sync insertion, quadrature modulation, 8 VSB, bandwidth, error rate, COFDM, flexibility, bandwidth	CO1,CO2
III	**Transmitters for Digital Television**: Precorrection and equalization, up conversion, precise frequency control, RF amplifiers, solid-state transmitters, RF amplifier modules, power supplies, cooling, automatic gain or level control, ac distribution, transmitter control, tube transmitters, performance quality.	CO1,CO3
IV	**Transmission Line for Digital Television:** Fundamental parameters, efficiency, effect of VSWR, system AERP, rigid coaxial transmission lines, dissipation, attenuation, and power handling, higher-order modes, peak power rating, frequency response, standard lengths, corrugated coaxial cables, wind load, waveguide, bandwidth, waveguide attenuation, power rating, frequency response, size trade-offs, waveguide or coax pressurization	CO1,CO4
V	**Test and Measurement for Digital Television:** Power measurements, average power measurement, calorimetry, power meters, peak power measurement, measurement uncertainty, testing digital television transmitters.	CO1,CO5

Learning Resources
Text Books
1. Gerald w. Collins, Fundamentals of Digital Television Transmission, John Wiley, 2001.
Reference Books
1 R. R. Gulati, Modern Television Practice, Principles, Technology and servicing, 2/e, New Age International Publishers, 2001. 2 John Arnold, Michael Frater, Mark Pickering, Digital Television Technology and Standards, John Wiley, 2007.
e- Resources & other digital material
1.https://www.youtube.com/watch?v=_nGnRvyHMEI&list=RDCMUCdlnqMpRrMcClK2fT6z8EEw&index=2 2.https://www.rfwireless-world.com/Tutorials/digital-television-DTV-basics.html

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ENERGY MANAGEMENT

Course Code	20EE2601A	**Year**	III	**Semester**	II
Course Category	OE-II	**Branch**	Offered by EEE	**Course Type**	Theory
Credits	3	**L-T-P**	3-0-0	**Prerequisites**	Basics of Electrical & Electronics Engineering
Continuous Internal Evaluation:	30	**Semester End Evaluation:**	70	**Total Marks:**	100

Course Outcomes	
Upon successful completion of the course, the student will be able to	
CO1	**Understand** the fundamentals of energy scenario, energy management, power factor, lighting and energy instrument, electric energy and economic aspects. **(L2)**
CO2	**Apply** the knowledge of energy scenario and energy management in electrical energy. **(L3)**
CO3	**Apply the** knowledge of Power Factor, Lighting and Energy Instruments use in electrical energy systems. **(L3)**
CO4	**Analyze the** methods to improve efficiency of electrical energy systems. **(L4)**
CO5	**Analyze** the economic aspects for energy conservation. **(L4)**
CO6	**Ability** to apply the various laws of energy management tools to measure the **basic** parameters and **submit a report.**

Contribution of Course Outcomes towards achievement of Program Outcomes & Strength of correlations (3:High, 2: Medium, 1:Low)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1														
CO2	3					2	2							
CO3	3		2		2									
CO4		3										2		
CO5		3		2							2			
CO6									3	3		2		

SYLLABUS		
Unit No.	**Contents**	**Mapped CO**
I	**Energy Scenario** Commercial and non-commercial energy, primary and secondary energy resources, global primary energy reserves, commercial energy production, final energy consumption, energy needs of growing economy, long term energy scenario, energy pricing, sector wise energy consumption in India, energy and environment.	**CO1,CO2, CO6**
II	**Energy Management** Introduction to energy management and objectives, principles of energy management, organizational structure, energy management program, energy policy, energy planning, controlling, ownership, reporting, summary.	**CO1,CO2, CO6**
III	**Power Factor Improvement, Lighting and Energy Instruments** Power factor –causes of low PF, effects of low PF, advantages of PF improvement, PF with non-linear loads, Lighting fundamentals, process to improve lighting efficiency– List of Instruments for energy audit- wattmeter, data loggers, thermocouples, pyrometers, lux meters, tongue testers (working principle and measurement).	**CO1, CO3, CO6**
IV	**Electric Energy Management** Introduction, power supply, effects of unbalanced voltages on the performance of motors, electric motor operating loads, determining electric motor operating loads, power meter, slip measurement, electric motor efficiency, sensitivity ofload to motor rpm, theoretical power consumption, motor efficiency management. **Energy efficient transformers**: Introduction, transformer loading/efficiency analysis.	**CO1,CO4, CO6**
V	**Economic Aspects and Analysis** Economics analysis introduction, objectives, general characteristics of capital investment, depreciation methods-straight line, unit production and double declining, time value of money-simple and compound interests, internal rate of return, net present value method, calculation of simple payback method.	**CO1,CO5,CO6**

Learning Resources
Text Books
[1] Wayne C.Turner, ―Energy management Hand book, John Wiley and son, 8th Edition 2012. [2] S.C. Tripathy, Electric ―Energy Utilization and Conservation, Tata McGraw Hill, 1991. [3] Guide books for National Certification Examination for Energy Manager / Energy Auditors Book-1, General Aspects (available online).
Reference Books
[1] John. C. Andres, Energy Efficient Electric Motors, Marcel Dekker Inc. Ltd – 3rd Edition,2005. [2] Paul W.O. Callaghan, ―Energy Management, McGraw hill Book Company,1st Edition,2005.
Web Links 1. https://www.routledgehandbooks.com/doi/10.1201/9781315374178-4 (Economic Aspects) 2. https://www.yourelectricalguide.com/2019/05/lux-meter-working-principle.html 3. https://electricalfundablog.com/clamp-meter-tong-tester-types-operating-principle-how-to-operate/ 4. https://www.elprocus.com/what-is-pyrometer-working-principle-and-its-types/ 5. http://www.dspmuranchi.ac.in/pdf/Blog/qqqqgmailcomthemocouple1.pdf 6. https://www.profitbooks.net/what-is-depreciation/

VALUE ENGINEERING

Course Code	20ME2601A	**Year**	III	**Semester**	II
Course Category	OE-II	**Branch**	Offered by ME	**Course Type**	Theory
Credits	3	**L-T-P**	3-0-0	**Prerequisites**	Nil
Continuous Internal Evaluation:	30	**Semester End Evaluation:**	70	**Total Marks:**	100

Course Outcomes	
Upon successful completion of the course, the student will be able to	
CO1	Understand the basic concepts, techniques and applications of value engineering(L2)
CO2	Describe job plan of value engineering.(L2)
CO3	Illustrate different value engineering techniques and versatility of value engineering.(L3)
CO4	Illustrate the efforts of value engineering team during the process of value engineering(L3)

Contribution of Course Outcomes towards achievement of Program Outcomes & Strength of correlations (3:High, 2: Medium, 1:Low)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1	2	2			3			3		3			3
CO2	1	2	2			3			3		3			3
CO3	1	2	2			3			3		3			3
CO4	1	2	2			3			3		3			3

SYLLABUS

Unit No.	Contents	Mapped CO
I	**Introduction**: Value engineering (VE) concepts, advantages, applications, problem recognition, and role in productivity, criteria for comparison, element of choice. **Organization**: Level of value engineering in the organization, size and skill of VE staff, small plant, VE activity, unique and quantitative evaluation of ideas.	**CO1**
II	**Value engineering job plan**: Introduction, orientation, information phase, speculation phase, analysis phase. **Selection and Evaluation of value engineering Projects**, Project selection, methods selection, value standards, application of value engineering methodology.	**CO1, CO2**

III	**Value engineering techniques**: Selecting products and operation for value engineering action, value engineering programmes, determining and evaluating function(s) assigning rupee equivalents, developing alternate means to required functions, **Decision making for optimum alternative**, use of decision matrix, queuing theory and Monte Carlo method make or buy, measuring profits, reporting results, Follow up, Use of advanced technique like Function Analysis System.	**CO1, CO3**
IV	**Versatility of value engineering**: Value engineering operation in maintenance and repair activities, value engineering in non-hardware projects. **Initiating a value engineering programme**: Introduction, training plan, career development for value engineering specialties.	**CO1, CO3**
V	**Value engineering level of effort**: Value engineering team, co-coordinator, designer, different services, definitions, construction management contracts, value engineering case studies.	**CO1, CO4**

Learning Resources

Text Books

1. Anil Kumar Mukhopadhyaya, "Value Engineering: Concepts Techniques and applications", SAGE Publications 2010

Reference Books

1. Alphonse Dell'Isola, "Value Engineering: Practical Applications for Design, Construction, Maintenance & Operations", R S Means Co., 1997.
2. Richard Park, "Value Engineering: A Plan for Invention", St. Lucie Press, 1999.
3. Del L. Younker, "Value Engineering analysis and methodology", Marcel Dekker Inc, New York, 2004.
4. Miles, L.D., "Techniques of Value Analysis and Engineering", McGraw Hill, second Edition, 1989.
5. Khanna, O.P., "Industrial Engineering and Management", Dhanpat Rai & Sons, 1993.
6. Anil Kumar Mukhopadhyaya, "Value Engineering Mastermind: From concept toValue Engineering Certification", SAGE Publications, 2003

HUMAN FACTORS IN ENGINEERING

Course Code	20ME2601B	**Year**	III	**Semester**	II
Course Category	OE-II	**Branch**	Offered by ME	**Course Type**	Theory
Credits	3	**L-T-P**	3-0-0	**Prerequisites**	-
Continuous Internal Evaluation	30	**Semester End Evaluation**	70	**Total Marks**	100

Course Outcomes		**Blooms Taxonomy Level**
Upon Successful completion of course, the student will be able to		
CO1	Understand the fundamentals of Human factors, Physical work, Anthropometry, Ergonomics, Machine controls, Seating design, Colour - Light, Temperature - Humidity –Illuminations and Measurement of sound.	L2
CO2	Identify the role of Anthropometry and Ergonomics in product design.	L3
CO3	Choose the effective seating design and Machine controls for improvement of human workplace.	L3
CO4	Represent the importance of colour and light, Temperature - Humidity –Illumination, Measurement of sound in human workplace.	L3

Contribution of Course Outcomes towards achievement of Program Outcomes & Strength of correlations (H:High, M: Medium, L:Low)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1		2			3			1			1	3	1
CO2	1		2			3			1			1	3	1
CO3	1		2			3			1			1	3	1
CO4	1		2			3			1			1	3	1

Syllabus		
Unit No	**Contents**	**Mapped CO**
I	**Fundamentals of Human Factors Engineering**: Human Biological, Ergonomic and psychological capabilities and limitations, Concepts of human factors engineering and Ergonomics, Man-Machine system and Design philosophy. **Physical work and energy expenditure**: Manual lifting, Work posture, Repetitive motion, Provision of energy for muscular work, Heat stress, Role of oxygen physical exertion, Measurement of energy expenditure, Respiration, Pulse rate and blood pressure during physical work, Physical work capacity and its evaluation.	**CO1**
II	**Anthropometry**: Physical dimensions of the human body as a working machine, Motion size relationships, Static and dynamic anthropometry, Anthropometric design principles, Using anthropometric measures for industrial design. **Ergonomics and product design**: Ergonomics in automated systems, Expert systems for ergonomic design, Anthropometric data and its application in ergonomic design, Limitations of anthropometric data, Use of computerized database.	**CO1, CO2**
III	**Machine controls:** Improvement of human work place through controls, Displays and Controls, Shapes and sizes of various controls and displays, Multiple display and control situations, Design of major controls in automobiles and machine tools, Principles of hand tool design. **Work place and seating design**: Design of office furniture, Redesign of instruments, Work process: Duration of rest periods, Design of visual displays, Design for shift work.	**CO1, CO3**
IV	**Color and light:** Color and the eye, Color consistency, Color terms, Reactions to color and color continuation, Color on engineering equipments. **Temperature-Humidity-Illumination and Contrast**: Use of Photometers, Recommended illumination levels, the ageing eye, Use of indirect (Reflected) lighting, Cost efficiency of illumination. Special purpose lighting for illumination and quality control.	**CO1** **CO4**
V	**Measurement of sound**: Noise exposure and hearing loss, Hearing protectors, Analysis and reduction of noise, Effects of noise, Performance annoyance of noise and interface with communication, Sources of vibration and performance effect of vibration.	**CO1** **CO4**

Learning Resources
Text Books
1. .M. S. Sanders and E. J. McCormick, Human Factors in Engineering Design, VII Edition, McGraw Hill International, 1993.
Reference books
1. P. V. Karpovich and W. E. Sinning, Physiology of Muscular Activity”, VII Edition, Saunders (W.B.) Co Ltd., 1971. 2. Applied Ergonomics Handbook, I.P.C. Science and Technology Press Limited, 1974. 3. M. Helander, A Guide to the Ergonomics of Manufacturing, II Edition, CRC Press, 1997. 4. K. H. E. Kroemer, H. B. Kroemer, K. E. Kroemer Elbert, Ergonomics: How to design for ease and efficiency, II Edition, Pearson Publications, 2001.

INTRODUCTION TO DATA STRUCTURES

Course Code	20CS2601A	**Year**	III	**Semester**	II
Course Category	OE-2	**Branch**	Other Branches	**Course Type**	Theory
Credits	3	**L-T-P**	3-0-0	**Prerequisites**	-
Continuous Evaluation :	30	**Semester End Evaluation:**	70	**Total Marks:**	100

Course Outcomes		
Upon successful completion of the course, the student will be able to		
CO1	Understand the basic concepts of data structures.	**L2**
CO2	Apply suitable Linear Data Structures to solve problems.	**L3**
CO3	Apply suitable Non Linear data structures to solve problems.	**L3**
CO4	Analyze the problem and develop solution using suitable datastructures.	**L4**

Contribution of Course Outcomes towards achievement of Program Outcomes & Strength of correlations (3:Substantial, 2: Moderate, 1:Slight)

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	3													
CO2	3													
CO3	3													
CO4		3							3	3				

Course Content		
UNIT-1	**Introduction:** Introduction to data structures, Abstract data types (ADT). **Array:** Array element identifier and addressing formulas, One-dimensional arrays, Applications. **Linked lists:** Introduction, Single linked list, double linked list, circular linked list, and operations on linked lists.	**CO1,CO2,CO4**
UNIT-2	**Linear Data Structures:** **Stacks:** Definition, operations, array implementation, linked list Implementation and applications.	**CO1,CO2,CO4**
UNIT-3	**Queues:** Definition, operations, array implementation and applications, Circular Queue and Double ended queue (DEQUE).	**CO1,CO2,CO4**
UNIT-4	**Sorting and Searching:** Searching- Linear and Binary search algorithms. Sorting- Bubble, Insertion, Selection, Merge, Quick sort algorithms.	**CO1,CO2,CO4**
UNIT-5	**Introduction to nonlinear data structure:** **Trees:** Definition, binary tree, Properties of Binary Trees, binary tree representation, binary tree traversal. **Graphs:** Definition, Representation of graph, graph traversals.	**CO1,CO3,CO4**

Learning Resources	
Text Books	1. Data Structures and Algorithm Analysis in C, Mark Allen Weiss, Second Edition, 2002, Pearson.
Reference Books	1. Classic Data Structures, Debasis Samantha, Second Edition, 2009, PHI.
e-Resources & other digital material	1.https://www.javatpoint.com/data-structure-array 2.http://www.geeksforgeeks.org/data-structures/ 3.http://www.studytonight.com/data-structures/

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MACHINE LEARNING LAB

Course Code	20IT3651	**Year**	III	**Semester**	II
Course Category	PC	**Branch**	IT	**Course Type**	Practical
Credits	1.5	**L-T-P**	0-0-3	**Prerequisites**	Python Programming Language
Continuous Internal Evaluation :	15	**Semester End Evaluation:**	35	**Total Marks:**	50

Course Outcomes		
Upon successful completion of the course, the student will be able to		
CO1	Apply Python programming constructs for solving problems.	**L3**
CO2	Implement programs as an individual on different IDEs/ online platforms.	**-**
CO3	Develop an effective report based on various programs implemented.	**-**
CO4	Apply technical knowledge for a given problem and express with an effective oral communication.	**L3**
CO5	Analyze outputs using given constraints/test cases.	**L4**

Contribution of Course Outcomes towards achievement of Program Outcomes & Strength of correlations (3:Substantial, 2: Moderate, 1:Slight)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	2	2		2								2	2
CO2	3		3		3								3	3
CO3										3			3	3
CO4	1									1			1	1
CO5		3											3	3

Syllabus		
Expt No	**Exercises**	**Mapped CO**
1.	Apply Data preprocessing techniques.	**CO1-CO5**
2.	Construct a Regression model using Supervised learning method.	**CO1-CO5**
3.	Construct a Classification model using Supervised learning method.	**CO1-CO5**
4.	Construct a machine learning model using Unsupervised partition clustering method.	**CO1-CO5**
5.	Construct a machine learning model using Unsupervised hierarchical clustering method.	**CO1-CO5**
6.	Construct a machine learning model for Association analysis.	**CO1-CO5**
7.	Apply Reinforcement learning technique to build an application.	**CO1-CO5**

Learning Resources
Text Books
1. Introduction to Machine Learning with Python Andreas C Muller & Sarah Guido First Shroff Publishers 2019 2. Introduction to Machine Learning, Ethem Alpaydin, Second Edition, 2010, Prentice Hall of India. 3. Machine Learning, Anuradha Srinivasaraghavan, and Vincy Joseph, Kindle Edition, 2020, WILEY.
References
1. Machine Learning by Tom M. Mitchell, International Edition 1997, McGraw Hill Education. 2. Machine Learning a Probabilistic Perspective, Kevin P Murphy & Francis Bach, First Edition, 2012, MIT Press. 3. Introduction to Data Mining, Tan, Vipin Kumar, Michael Steinbach, 9th Edition, 2013, Pearson 4. “Deep Learning”, Ian Goodfellow, Yoshua Bengio, Aaron Courville, 2016, MIT Press.
e- Resources & other digital material
1.https://www.coursera.org/learn/machine-learning-with-python 2. https://nptel.ac.in/courses/106/106/106106139/

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FULL STACK TECHNOLOGIES LAB

Course Code	20IT3652	**Year**	III	**Semester**	II
Course Category	PC	**Branch**	IT	**Course Type**	PRACTICAL
Credits	1.5	**L-T-P**	0-0-3	**Prerequisites**	HTML,CSS,JAVASCRIPT, ANY RDBMS (SQL)
Continuous Internal Evaluation:	15	**Semester End Evaluation:**	35	**Total Marks:**	50

Course Outcomes		**Blooms Taxonomy Level**
Upon successful completion of the course, the student will be able to		
CO1	Develop web applications using Express JS, React JS	**L2**
CO2	Develop server side web applications using Node.js	**L3**
CO3	Design and Develop web applications using various libraries and frameworks	**L3**
CO4	Build web applications using MangoDB	**L3**

Contribution of Course Outcomes towards achievement of Program Outcomes & Strength of correlations (3:Substantial, 2: Moderate, 1:Slight)

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO 1			3									3	3	3
CO 2			3									3	3	3
CO 3			3									3	3	3
CO 4			3									3	3	3

Syllabus		
Experiment No	**Contents**	**Mapped CO**
1	Demonstrate React Component Life cycle	**CO1,CO3**
2	Develop a Calculator React Application	**CO1,CO3**
3	Develop a Redux application.	**CO1,CO3**
4	Develop Website demonstrate React Routing.	**CO1,CO3**
5	Develop a Node.js application demonstrating handling data I/O (Buffer, Stream, Zlib modules)	**CO2,CO3**
6	Demonstrate accessing File system from Node.js application	**CO2,CO3**
7	Demonstrate Express Routing.	**CO1,CO3**
8	Demonstrate Express.js Authentication	**CO1,CO3**
9	Demonstrate Manipulating MongoDB Documents from Node.js	**CO4,CO3**
10	Demonstrate Accessing MongoDB from Node.js.	**CO4,CO3**

Learning Resources
Text book
1.React in Action, Mark Tielens Thomas, Manning Publications, 2018, ISBN:978-1617293856 ,First Edition 2. Node.js, MongoDB and Angular Web Development, Brad Dayley, Brendan Dayley Caleb Dayley, 2/e, Pearson Edu., Inc. 2018, ISBN: 978-0-13-465553-6
References
1.Pro MERN Stack, Vasan Subramanian, 2/e, Apress, 2019, ISBN: 978-1-4842-4390-9 2.FullStack React – The Complete Guide to ReactJS and Friends, Anthony Accomazzo, Nate Murray, Ari Lerner, Clay Allsopp, David Guttman, and Tyler McGinnis, 2020, \newline
e-Resources and other Digital Material
https://html5hive.org/wp-content/uploads/2018/04/The-Complete-Beginners-Guide-to-React_Dyrr.pdf

INTERNET OF THINGS LAB

Course Code	20ES1652	**Year**	III	**Semester**	II
Course Category	ES	**Branch**	IT	**Course Type**	Lab
Credits	1.5	**L-T-P**	0-0-3	**Prerequisites**	Nil
Continuous Internal Evaluation:	15	**Semester End Evaluation:**	35	**Total Marks:**	50

Course Outcomes		
Upon successful completion of the course, the student will be able to		
CO1	**Apply** appropriate techniques, resources and IDE for modeling system designs with understanding of limitations.	**L3**
CO2	**Develop** various sensor interfacing using Visual Programming Language	**L3**
CO3	**Evaluate** Wireless Control of Remote Devices	**L5**
CO4	**Design and develop** Mobile Application which can interact with Sensors and Actuators	**L6**
CO5	**Make** an effective report based on experiments.	**L6**

Contribution of Course Outcomes towards achievement of Program Outcomes & Strength of correlations (3:Substantial, 2: Moderate, 1:Slight)														
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1			3										3	3
CO2		3											3	3
CO3				1									1	1
CO4			2										2	2
CO5										3				
Average*		**3**	**3**	**1**						**3**			**2**	**2**

Syllabus		
Expt. No.	**Contents**	**Mapped CO**
1	Introduction to Arduino and necessary software installation. Interface and control LED.	CO1, CO5
2	Digital I/O Interface.	CO1, CO2, CO5
3	Analog I/O Interface.	CO1, CO2, CO5
4	Fabrication and direction control of wheeled robot using Arduino.	CO1, CO2, CO5
5	Serial Communication - Device Control.	CO1, CO2, CO5
6	Wireless Module Interface.	CO1,CO3, CO5
7	Basic Android App Development using MIT App Inventor.	CO1,CO4, CO5
8	Smart Home Android App Development using App Inventor and Arduino.	CO1,CO4, CO5

`

Learning Resources

Text Books

1. Sylvia Libow Martinez, Gary S Stager, "Invent To Learn: Making, Tinkering, and Engineering in the Classroom", Constructing Modern Knowledge Press, 2016.

References

1. Michael Margolis, "Arduino Cookbook", Oreilly, 2011.

e-Resources & other digital material

1.https://nptel.ac.in/courses/108/108/108108098/

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MOBILE APPLICATION DEVELOPMENT

Course Code	20SA8652	**Year**	III	**Semester**	II
Course Category	**SC**	**Branch**	IT	**Course Type**	SKILL
Credits	2	**L-T-P**	1-0-2	**Prerequisites**	Java Programming
Continuous Internal Evaluation :	-	**Semester End Evaluation:**	50	**Total Marks:**	50

Course Outcomes		
Upon successful completion of the course, the student will be able to		
CO1	Basics of android mobile application design models and styles.	**L2**
CO2	Apply activities, dialog boxes, fragments, intents, views and layouts to android apps.	**L3**
CO3	Apply views and layouts to android apps.	**L3**
CO4	Design and develop mobile apps for given real time scenario using modern tool android studio.	**L3**

Contribution of Course Outcomes towards achievement of Program Outcomes & Strength of correlations (3:Substantial, 2: Moderate, 1:Slight)

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	1				3									
CO2	2				3	3							3	3
CO3	2	3			3	3				3				
CO4	2	3	3	3	3	3		3		3			3	3

Syllabus		
Unit No.	**Contents**	**Mapped CO**
I	**GETTING STARTED WITH ANDROID PROGRAMMING**: What Is Android?, Versions of android, Features of android, Architecture of android. **ACTIVITIES, INTENTS:** Understanding activities, Life cycle of an activity.	CO1, CO2
II	**INTENTS:** Linking activities using intents, Calling built in apps using intents, Displaying Notifications.	CO1, CO2
III	**GETTING TO KNOW ANDROID UI:** Understanding the components of screen - Views and view groups, Liner layout, Absolute layout, Table layout, Relative layout, Frame layout, Scroll view.	CO1, CO3, CO4
IV	**DISPLAY ORIENTATION, PICTURES and MENUS:** Anchoring views, Resizing and repositioning views, Managing changes to screen orientation, Utilizing the action bar, Creating UI programmatically, Using image views to display pictures and Menus.	CO1, CO3, CO4
V	**DESIGNING UI WITH VIEWS:** Using basic views - Text view, Button, Image Button, Edit text, check Box, Toggle button, Radio button, and Radio group views, Progress bar view and Auto complete text view.	CO1, CO3, CO4

Lab Course

Expt. No.	**Contents**	**Mapped CO**
1	Installation of Android studio, its required tools and Android Virtual Device (AVD).	**CO1**
2	Develop an android program to displaying your name in AVD.	**CO1**
3	Develop an android program to illustrate how to create a basic Activity and applying themes, styles to it.	**CO1**
4	Develop an android program to displaying various types of Dialog objects.	**CO2**
5	Develop an android program to illustrate linking activities with Intents.	**CO2**
6	Develop an android program to illustrate passing data using intent object.	**CO2**
7	Develop an android program to illustrate different layouts.	**CO3**
8	Build an Android application.	**CO4**

Learning Resources

Text Book
1. Wei-Meng Lee, “Beginning Android Application Development”, 1st Edition, John Wiley & Sons, Inc., 2012.
References
1. Raimon Refols Montane, Laurence Dawson, “Learning and Android Application Development”, 1st Edition, PACKT Publishing, 2016. 2. Adam Gerber and Clifton Craig, “Learn Android Studio”, 1st Edition, Apress, 2015
e-Resources and other Digital Material
1.https://www.coursera.org/specializations/android-app-development#courses 2.https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_0130944503427072002808_shared/overview

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INFORMATION TECHNOLOGY

SOFTWARE ENGINEERING

(MINOR)

Course Code	20IT5601	**Year**	III	**Semester**	II
Course Category	Minor	**Branch**	IT	**Course Type**	Theory
Credits	4	**L-T-P**	4-0-0	**Prerequisites**	Basics of IT
Continuous Internal Evaluation:	30	**Semester End Evaluation:**	70	**Total Marks:**	100

Course Outcomes		**Blooms Taxonomy Level**
Upon Successful completion of course, the student will be able to		
CO1	Understand the process of software engineering and various process Models.	L2
CO2	Design the requirements of software system.	L3
CO3	Use various design elements to prepare software system.	L3
CO4	Analyze various testing techniques.	L4

Contribution of Course Outcomes towards achievement of Program Outcomes & Strength of correlations(H: High, M:Medium, L: Low)

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1		3								3				3
CO2			3						3	3			3	3
CO3			3						3	3			3	3
CO4			3						3	3			3	3

	Syllabus	
Unit No	**Contents**	**Mapped CO**
I	**Software and Software Engineering:** The Nature of Software, The Unique Nature of Web Apps, Software Engineering, Software Process, Software Engineering Practice, Software Myths. **Process Models:** A Generic Process Model: Defining a framework activity, Prescriptive Process Models: The Waterfall Model, Incremental Process Model, Evolutionary Process Model, The Unified Process, What is an Agile Process?, XP Process.	**CO1**
II	**Requirements Analysis And Specification:** Requirements Gathering and Analysis, Software Requirement Specification (SRS): Characteristics of good SRS, Functional Requirements, Organization of SRS. **Software Design:** Overview of the Design Process, How to Characterize of a Design? Cohesion and Coupling, Approaches to Software Design.	**CO2, CO3**
III	**Function-Oriented Software Design:** Overview of SA/SD Methodology, Structured Analysis, Structured Design, Detailed Design, Design Review. **User Interface Design**: Characteristics of Good User Interface, Basic Concepts, Types of User Interfaces, A User Interface Design Methodology.	**CO1, CO3**
IV	**Coding And Testing:** Coding, Code Review, Software Documentation, Testing, Unit Testing, Black-Box Testing, White-Box Testing, Debugging, Integration Testing, System Testing.	**CO1, CO4**
V	**Software Reliability And Quality Management:** Software Reliability, Statistical Testing, Software Quality, Software Quality Management System. **Software Maintenance:** Software maintenance, Maintenance Process Models, Maintenance Cost. **Software Reuse**: what can be reused? Why almost No Reuse So Far? Basic Issues in Reuse Approach.	**CO1, CO4**

Learning Resources
Text Books
1. Software Engineering-A Practitioner's Approach, RogerS.Pressman, Seventh Edition McGraw Hill International Edition. 2. Fundamentals of Software Engineering, Rajib Mall, Third Edition,PHI.
References
3. Software Engineering: A Primer,Waman SJawadekar,TataMc Graw-Hill,2008 4. Software Engineering, A Precise Approach, Pankaj Jalote,Wiley India,2010. 5. Software Engineering, Principles and Practices, DeepakJain, Oxford University Press.
E-Resources and other Digital Material
1.https://nptel.ac.in/courses/106101061/

PVP SIDDHARTHA INSTITUTE OF TECHNOLOGY, KANURU, VIJAYAWADA
(AUTONOMOUS)
INFORMATION TECHNOLOGY

SOFTWARE ARCHITECTURE AND DESIGN PATTERNS (Honors)

Course Code	20IT6601	**Year**	III	**Semester**	II
Course Category	Honors	**Branch**	IT	**Course Type**	Theory
Credits	4	**L-T-P**	4-0-0	**Prerequisites**	Software Engineering
Continuous Internal Evaluation :	30	**Semester End Evaluation:**	70	**Total Marks:**	100

Course Outcomes		
Upon Successful completion of course, the student will be able to		
CO1	Demonstrate an understanding of a range of design patterns. Be capable of comprehending a design presented using this vocabulary.	L2
CO2	Experience core design principles and to assess the quality of a design with respect to these principles.	L3
CO3	Capable of applying these principles in the design of object oriented systems.	L3
CO4	Design and implement codes with higher performance and lower complexity	L4
CO5	Select and apply suitable patterns in specific contexts	L4

Syllabus		
Unit No	**Contents**	**Mapped CO**
I	**Introduction:** what is a design pattern? Describing design patterns, the catalog of design pattern, organizing the catalog, how design patterns solve design problems, how to select a design pattern, how to use a design pattern. A Notation for Describing Object-Oriented Systems. **Analysis a System:** overview of the analysis phase, stage 1: gathering the requirements functional requirements specification, defining conceptual classes and relationships, using the knowledge of the domain. Design and Implementation, discussions and further reading.	**CO1**
II	**Design Pattern Catalog:** Structural patterns, Adapter, bridge, composite, decorator, facade, flyweight, proxy.	**CO1,CO2,CO5**
III	**Behavioral Patterns:** Chain of Responsibility, Command, Interpreter, Iterator, Mediator, Memento, Observer, State, Template Method	**CO1,CO2,CO5**
IV	**Interactive systems and the MVC architecture:** Introduction, The MVC architectural pattern, analyzing a simple drawing program, designing the system, designing of the subsystems, getting into implementation, implementing undo operation , drawing incomplete items, adding a new feature, pattern based solutions.	**CO1, CO4, CO5**
V	**Designing with Distributed Objects:** Client server system, java remote method invocation, implementing an object oriented system on the web (discussions and further reading) a note on input and output, selection statements, loops arrays.	**CO1, CO3, CO5**

Learning Resources
Text Books
1. Brahma Dathan, Sarnath Rammath, Object-oriented analysis, design and implementation, Universities Press,2013 2. Erich Gamma, Richard Helan, Ralph Johman, John Vlissides , Design Patterns, Pearson Publication,2013.
References
1. Frank Bachmann, Regine Meunier, Hans Rohnert “Pattern Oriented Software Architecture” –Volume 1, 1996. 2. William J Brown et al., "Anti-Patterns: Refactoring Software, Architectures and Projects in Crisis", John Wiley, 1998.
E- Resources and other Digital Material
NPTEL VIDEO LECTURES

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INFORMATION TECHNOLOGY

ADVANCED JAVA AND J2EE
(Honors)

Course Code	20IT6601	**Year**	III	**Semester**	II
Course Category	Honors	**Branch**	IT	**Course Type**	Theory
Credits	4	**L-T-P**	4-0-0	**Prerequisites**	C,C++
Continuous Internal Evaluation :	30	**Semester End Evaluation:**	70	**Total Marks:**	100

Course Outcomes		
Upon Successful completion of course, the student will be able to		
CO1	Interpret the need for advanced Java concepts like enumerations and collections in developing modular and efficient programs	L2
CO2	Build server side program using JSP	L3
CO3	Describe how servlets fit into Java-based web application architecture	L4
CO4	Develop reusable software components using Java Beans	L4

Syllabus		
Unit No	**Contents**	**Mapped CO**
I	**Enumerations, Autoboxing and Annotations(metadata):** Enumerations, Enumeration fundamentals, the values() and valueOf() Methods, java enumerations are class types, enumerations Inherits Enum, example, type wrappers, Autoboxing, Autoboxing and Methods, Autoboxing/Unboxing occurs in Expressions, Autoboxing/Unboxing, Boolean and character values, Autoboxing/Unboxing helps prevent errors, A word of Warning. Annotations, Annotation basics, specifying retention policy, Obtaining Annotations at run time by use of reflection, Annotated element Interface, Using Default values, Marker Annotations, Single Member annotations, Built-In annotations.	**CO1**
II	**The collections and Framework:** Collections Overview, Recent Changes to Collections, The Collection Interfaces, The Collection Classes, Accessing a collection Via an Iterator, Storing User Defined Classes in Collections, The Random Access Interface, Working With Maps, Comparators, The Collection Algorithms, Why Generic Collections?, The legacy Classes and Interfaces, Parting Thoughts on Collections.	**CO1**
III	**Java Servlet Technology:** What is a servlet?, The Example Servlets, Servlet Life Cycle, Sharing Information, Initializing a Servlet, Writing Service Methods, Filtering Requests and Responses, Invoking Other Web Resources, Accessing the Web Context, Maintaining Client State, Finalizing a Servlet.	**CO3**
IV	**Java Server Pages Technology:** What is a JSP page? The Example JSP Pages, The Life Cycle of a JSP Page, Initializing and Finalizing a JSP Page, Creating Static Content, Creating Dynamic Content, Including Content in a JSP Page, Transferring Control to Another Web Component, Including an Applet, Extending the JSP Language.	**CO2**
V	**JavaBeans Components in JSP Pages:** JavaBeans Component Design Conventions, Why use a JavaBeans Component?, Creating and Using a JavaBeans Component,	**CO4**

	Setting JavaBeans Component Properties, Retrieving JavaBeans Component Properties.	

Learning Resources
Text Books
1. Herbert Schildt: JAVA the Complete Reference, 7th/9th Edition, Tata McGraw Hill, 2007. 2. Stephanie Bodoff, Dale Green, Kim Haase, Eric Jendrock, Monica Pawlan, Beth Stearns: The J2EE Tutorial, 2nd Edition, Pearson Education Asia, 2004.
References
1. Y. Daniel Liang: Introduction to JAVA Programming, 7thEdition, Pearson Education, 2007. 2. Jim Keogh: J2EE-TheCompleteReference, McGraw Hill, 2007. 3. Uttam K Roy, Advanced JAVA programming, Oxford University press, 2015.
E- Resources and other Digital Material
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INFORMATION TECHNOLOGY

STORAGE AREA NETWORKS
(Honors)

Course Code	20IT6601	**Year**	III	**Semester**	II
Course Category	Honors	**Branch**	IT	**Course Type**	Theory
Credits	4	**L-T-P**	4-0-0	**Prerequisites**	Computer Networks
Continuous Internal Evaluation :	30	**Semester End Evaluation:**	70	**Total Marks:**	100

Course Outcomes		
Upon Successful completion of course, the student will be able to		
CO1	Identify key challenges in managing information and analyze different storage networking technologies and virtualization	L2
CO2	Explain components and the implementation of NAS	L3
CO3	Describe CAS architecture and types of archives and forms of virtualization	L3
CO4	Illustrate the storage infrastructure and management activities	L3

Syllabus		
Unit No	**Contents**	**Mapped CO**
I	**Storage System:** Introduction to Information Storage: Information Storage, Evolution of Storage Architecture, Data Center Infrastructure, Virtualization and Cloud Computing. **Data Center Environment:** Application Database Management System (DBMS), Host (Compute), Connectivity, Storage, Disk Drive Components, Disk Drive Performance, Host Access to Data, Direct-Attached Storage, Storage Design Based on Application	**CO1**
II	**Data Protection - RAID:** RAID Implementation Methods, RAID Array Components, RAID Techniques, RAID Levels, RAID Impact on Disk Performance, RAID Comparison. **Intelligent Storage Systems:** Components of an Intelligent Storage System, Types of Intelligent Storage Systems. **Fibre Channel Storage Area Networks - Fibre Channel:** Overview, The SAN and Its Evolution, Components of FC SAN.	**CO2,CO5**
III	**IP SAN and FCoE:** iSCSI, FCIP, **Network-Attached Storage:** General-Purpose Servers versus NAS Devices, Benefits of NAS, File Systems and Network File Sharing, Components of NAS, NAS I/O Operation, NAS Implementations, NAS File-Sharing Protocols, Factors Affecting NAS Performance	**CO3,CO5**
IV	**Introduction to Business Continuity:** Information Availability, BC Terminology, BC Planning Life Cycle, Failure Analysis, Business Impact Analysis, BC Technology Solutions, **Backup and Archive:** Backup Purpose, Backup Considerations, Backup Granularity, Recovery Considerations, Backup Methods, Backup Architecture, Backup and Restore Operations, Backup Topologies, Backup in NAS Environments	**CO4, CO5**
V	**Local Replication:** Replication Terminology, Uses of Local Replicas, Replica Consistency, Local Replication Technologies, Tracking Changes to Source and Replica, Restore and Restart Considerations, Creating Multiple Replicas. **Remote Replication:** Modes of Remote Replication, Remote Replication Technologies. **Securing the Storage Infrastructure:** Information Security Framework, Risk Triad, Storage Security Domains. Security Implementations in Storage Networking	**CO1**

Learning Resources
Text Books
1. EMC Education Services, "Information Storage and Management", Wiley India Publications, 2009. ISBN: 9781118094839
References
1. Paul Massiglia, Richard Barker, "Storage Area Network Essentials: A Complete Guide to Understanding and Implementating SANs Paperback", 1st Edition, Wiley India Publications, 2008
E- Resources and other Digital Material
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INFORMATION TECHNOLOGY

HIGH PERFORMANCE COMPUTING
(Honors)

Course Code	20IT6601	**Year**	III	**Semester**	II
Course Category	Honors	**Branch**	IT	**Course Type**	Theory
Credits	4	**L-T-P**	4-0-0	**Prerequisites**	
Continuous Internal Evaluation :	30	**Semester End Evaluation:**	70	**Total Marks:**	100

Course Outcomes		
Upon Successful completion of course, the student will be able to		
CO1	Identify key challenges in managing information and analyze different storage networking technologies and virtualization	L2
CO2	Explain components and the implementation of NAS	L3
CO3	Describe CAS architecture and types of archives and forms of virtualization	L3
CO4	Illustrate the storage infrastructure and management activities	L3

Syllabus		
Unit No	**Contents**	**Mapped CO**
I	**Introduction to Parallel Computing:** Motivating Parallelism, Scope of Parallel Computing, **Parallel Programming Platforms:** Implicit Parallelism: Trends in Microprocessor Architectures, Limitations of Memory System Performance, Dichotomy of Parallel Computing Platforms, Physical Organization of Parallel Platforms, Communication Costs in Parallel Machines, Routing Mechanisms for Interconnection Networks, Impact of Process-Processor Mapping and Mapping Techniques.	CO1
II	**Principles of Parallel Algorithm Design:** Preliminaries, Decomposition Techniques, Characteristics of Tasks and Interactions, Mapping Techniques for Load Balancing, Methods for Containing Interaction Overheads, Parallel Algorithm Models **Basic Communication Operations:** One-to-All Broadcast and All-to-One Reduction, Allto-All Broadcast and Reduction, All-Reduce and Prefix-Sum Operations, Scatter and Gather, All-to-All Personalized Communication, Circular Shift, Improving the Speed of Some Communication Operations	CO2,CO5
III	**Analytical Modeling of Parallel Programs:** Sources of Overhead in Parallel Programs, Performance Metrics for Parallel Systems, The Effect of Granularity on Performance, Scalability of Parallel Systems. Minimum Execution Time and Minimum Cost-Optimal Execution Time, Asymptotic Analysis of Parallel Programs Section 5.7. Other Scalability Metrics, **Programming Using the Message-Passing Paradigm:** Principles of Message-Passing Programming, The Building Blocks: Send and Receive Operations, MPI: the Message Passing Interface, Topologies and Embedding, Overlapping Communication with Computation, Collective Communication and Computation Operations, Groups and Communicators	CO3,CO5
IV	**Programming Shared Address Space Platforms:** Thread Basics, Why Threads?, The POSIX Thread API, Thread Basics: Creation and Termination, Synchronization Primitives in Pthreads, Controlling Thread and Synchronization Attributes, Thread Cancellation, 08 Composite Synchronization Constructs, Tips for Designing	CO4, CO5

	Asynchronous Programs, OpenMP: a Standard for Directive Based Parallel Programming **Dense Matrix Algorithms:** Matrix-Vector Multiplication, Matrix-Matrix Multiplication, Solving a System of Linear Equations Sorting: Issues in Sorting on Parallel Computers, Sorting Networks, Bubble Sort and its Variants, Quicksort, Bucket and Sample Sort.	
V	**Graph Algorithms:** Definitions and Representation, Minimum Spanning Tree: Prim's Algorithm, Single-Source Shortest Paths: Dijkstra's Algorithm, All-Pairs Shortest Paths, Transitive Closure, Connected Components, Algorithms for Sparse Graphs, **Search Algorithms for Discrete Optimization Problems:** Definitions and Examples, Sequential Search Algorithms, Search Overhead Factor, Parallel Depth-First Search, Parallel Best-First Search, Speedup, Anomalies in Parallel Search Algorithms	CO1

Learning Resources
Text Books
1.Introduction to Parallel Computing, AnanthGrama, Anshul Gupta, George Karypis, and Vipin Kumar, 2nd edition, Addison-Welsey, 2003.
References
1.Grama, A. Gupta, G. Karypis, V. Kumar, An Introduction to Parallel Computing, Design and Analysis of Algorithms: 2/e, Addison-Wesley, 2003. 2. G.E. Karniadakis, R.M. Kirby II, Parallel Scientific Computing in C++ and MPI: A Seamless Approach to Parallel Algorithms and their Implementation, Cambridge University Press, 2003. 3. Wilkinson and M. Allen, Parallel Programming: Techniques and Applications Using Networked Workstations and Parallel Computers, 2/E, Prentice Hall, 2005. 4. M.J. Quinn, Parallel Programming in C with MPI and OpenMP, McGraw-Hill, 2004. 5. .S. Almasi and A. Gottlieb, Highly Parallel Computing, 2/E, Addison-Wesley, 1994. 6. David Culler Jaswinder Pal Singh,"Parallel Computer Architecture: A hardware/Software Approach", Morgan Kaufmann, 1999. 7. Kai Hwang, "Scalable Parallel Computing", McGraw Hill 1998.
E- Resources and other Digital Material
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INFORMATION TECHNOLOGY

WIRELESS SENSOR NETWORKS
(Professional Elective –III)

Course Code	20IT4701A	**Year**	IV	**Semester**	I
Course Category	**PE3**	**Branch**	IT	**Course Type**	Theory
Credits	3	**L-T-P**	3-0-0	**Prerequisites**	Computer Networks
Continuous Internal Evaluation:	30	**Semester End Evaluation:**	70	**Total Marks:**	100

Course Outcomes		**Blooms Taxonomy Level**
Upon Successful completion of course, the student will be able to		
CO1	Design a wireless sensor network for given sensor data using microcontroller, transceiver, middleware and operating system.	L2
CO2	Evaluate the performance of schedule based and random Medium Access Control protocols for power consumption, fairness, channel utilization and control packet overhead.	L3
CO3	Evaluate the performance of Geographic routing protocols for power consumption, scalability and latency parameters.	L3
CO4	Evaluate the performance of transport control protocols for congestion detection and avoidance, reliability and control packet overhead parameters.	L3

Strength of Correlation between CO – PO, CO- PSO in scale of 1-3

1: Slight (low), 2: Moderate (medium) 3: Substantial (High)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3													
CO2		3												
CO3				3										
CO4				3									3	3
Overall course	3	3		3									3	3

Syllabus		
Unit No	**Contents**	**Mapped CO**
I	Introduction Wireless Networks, Protocol Suites and Standards, OSI Model and TCP/IP Protocol Suite, Adhoc Networks, Comparison of Adhoc and Sensor Networks, Applications of Sensor Networks, Challenges and Hurdles in Sensor network design	**CO1**

II	Wireless Transmission Technology and Systems Bluetooth; IEEE 802.11a/b/g/n series of wireless LANs; ZigBee; Radio-frequency identification (RFID) Traditional Transport Control Protocols-TCP, UDP; Feasibility of Using TCP or UDP for WSNs, Transport Protocol Design Issues, Existing Transport Control Protocols- CODA (Congestion Detection and Avoidance), ESRT (Event-to-Sink Reliable Transport) Performance of Transport Control Protocols.	**CO1, CO2**
III	Sensor-node Architecture Hardware components, Energy consumption of sensor nodes, Operating systems and execution environments, Physical layer and transceiver design considerations in Wireless Sensor Networks.	**CO1, CO2**
IV	Medium Access Control Protocols for Wireless Sensor Networks Fundamentals of MAC Protocols, Performance Requirements, Types of MAC protocols - Schedule-Based and Random Access-Based Protocols, Sensor-MAC, Zebra-MAC	**CO1, CO3**
V	Routing Protocols for Wireless Sensor Networks Fundamentals of Routing Protocols, Performance Requirements, Routing Strategies in Wireless Sensor Networks - Flooding and its variants, LEACH, Power-Efficient Gathering in Sensor Information Systems, Directed diffusion, Geographical routing.	**CO1, CO4**

Learning Resources

Text Books

1. Holger Karl, Andreas Willig, Protocols and Architectures for Wireless Sensor Networks, John Wiley.
2. Kazem Sohraby, Daniel Minoli, Taieb Znati, Wireless Sensor Networks: Technology, Protocols, and Applications, John Wiley.
3. Ananthram Swami, Qing Zhao, Yao-Win Hong, Lang Tong, Wireless Sensor Networks, Signal Processing and Communications Perspectives, John Wiley.
4. C. S. Raghavendra, Krishna M. Sivalingam, Taieb Znati, Wireless Sensor Networks, Kluwer Academic.
5. Bhaskar Krishnamachari, Networking Wireless Sensors, Cambridge University Press.

References

1. Raghavendra, Cauligi S, Sivalingam, Krishna M., Zanti Taieb, Wireless Sensor Network, Springer 1/e, 2004 (ISBN: 978, 4020, 7883, 5).
2. Ian F. Akyildiz and Mehmet Can Vuran, Wireless Sensor Networks, John Wiley and Sond Ltd, Publication, 2010

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INFORMATION TECHNOLOGY

RECOMMENDER SYSTEMS
(Professional Elective –III)

Course Code	20IT4701B	**Year**	IV	**Semester**	I
Course Category	**PE3**	**Branch**	IT	**Course Type**	Theory
Credits	3	**L-T-P**	3-0-0	**Prerequisites**	Opinion mining
Continuous Internal Evaluation:	30	**Semester End Evaluation:**	70	**Total Marks:**	100

Strength of Correlation between CO – PO , CO- PSO in scale of 1-3

1: Slight (low), 2: Moderate (medium) 3: Substantial (High)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3													
CO2	3													
CO3	3													
CO4		3											3	3
Overall course	3	3											3	3

Course Outcomes		**Blooms Taxonomy Level**
Upon Successful completion of course, the student will be able to		
CO1	To understand basic techniques and problems in the field of recommender systems	L2
CO2	Evaluate Types of recommender systems: non-personalized, content based, collaborative filtering	L3
CO3	Apply algorithms and techniques to develop Recommender Systems that are widely used in the Internet industry	L3
CO4	To develop state-of-the-art recommender systems	L3

Syllabus		
Unit No	**Contents**	**Mapped CO**
I	**Introduction:** Recommender system functions, Linear Algebra notation: Matrix addition, Multiplication, transposition, and inverses; covariance matrices, Understanding ratings, Applications of recommendation systems, Issues with recommender system.	**CO1**
II	**Collaborative Filtering:** User-based nearest neighbour recommendation, Item-based nearest neighbour recommendation, Model based and pre-processing based approaches, Attacks on collaborative recommender systems	**CO1, CO2**
III	**Content-based recommendation:** High level architecture of content-based systems, Advantages and drawbacks of content based filtering, Item profiles, Discovering features of documents, Obtaining item features from tags,	**CO1, CO2**

	Representing item profiles, Methods for learning user profiles, Similarity based retrieval, Classification algorithms.	
IV	**Knowledge based recommendation:** Knowledge representation and reasoning, Constraint based recommenders, Case based recommenders. **Hybrid approaches:** Opportunities for hybridization, Monolithic hybridization design: Feature combination, Feature augmentation, Parallelized hybridization design: Weighted, Switching, Mixed, Pipelined hybridization design: Cascade Meta-level, Limitations of hybridization strategies.	**CO1, CO3**
V	**Evaluating Recommender System:** Introduction, General properties of evaluation research, Evaluation designs, Evaluation on historical datasets, Error metrics, Decision-Support metrics, User-Centred metrics.	**CO1,** **CO4**

Learning Resources
Text Books
1. Jannach D., Zanker M. and FelFering A., Recommender Systems: An Introduction, Cambridge University Press(2011), 1st ed. 2.
References
1. Ricci F., Rokach L., Shapira D., Kantor B.P., Recommender Systems Handbook, Springer(2011), 1st ed. 2. Manouselis N., Drachsler H., Verbert K., Duval E., Recommender Systems For Learning, Springer (2013), 1st ed

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INFORMATION TECHNOLOGY

ELEMENTS OF SOFTWARE PROJECT MANAGEMENT
(Professional Elective –III)

Course Code	20IT4701C	**Year**	IV	**Semester**	I
Course Category	**PE3**	**Branch**	IT	**Course Type**	Theory
Credits	3	**L-T-P**	3-0-0	**Prerequisites**	Software Engineering
Continuous Internal Evaluation:	30	**Semester End Evaluation:**	70	**Total Marks:**	100

Course Outcomes		**Blooms Taxonomy Level**
Upon Successful completion of course, the student will be able to		
CO1	Understand the concepts of conventional software management and software economics	L2
CO2	Gain the knowledge on software development lifecycle and artifacts	L3
CO3	Understand the process workflows and milestones	L3
CO4	Analyze the concepts of work break down structure, cost estimation and process automation	L3

<u>Strength of Correlation between CO – PO , CO- PSO in scale of 1-3</u>

1: Slight (low), 2: Moderate (medium) 3: Substantial (High)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3													
CO2	3													
CO3	3													
CO4				3					3		3		3	3
Overall course	3			3					3		3		3	3

Syllabus		
Unit No	**Contents**	**Mapped CO**
I	Conventional Software Management: The waterfall model, conventional software Management performance. Evolution of Software Economics: Software Economics, pragmatic software cost estimation. Improving Software Economics: Reducing Software product size, improving software processes, improving team effectiveness, improving automation, Achieving required quality, peer Inspections	**CO1**
II	The old way and the new: The principles of conventional software Engineering, principles of modern software management, transitioning to an iterative process. Life cycle phases: Engineering and production stages, inception, elaboration, construction, transition phases. Artifacts of the process: The artifact sets, Management artifacts, Engineering artifacts, Programmatic artifacts	**CO1,CO2**
III	Model based software architectures: A Management perspective and technical perspective. Work Flows of the process: Software process workflows, Iteration workflows. Checkpoints of the process: Major mile stones, Minor Milestones, Periodic status assessments.	**CO1,CO2**
IV	Iterative Process Planning: Work breakdown structures, planning guidelines, cost and schedule estimating, Iteration planning process, Pragmatic planning. Project Organizations and Responsibilities: Line-of-Business Organizations, Project Organizations, evolution of Organizations. Process Automation: Automation Building blocks, The Project Environment	**CO1,CO3**
V	Project Control and Process instrumentation: The seven core Metrics, Management indicators, quality indicators, life cycle expectations, pragmatic Software Metrics, Metrics automation, Process discriminates.	**CO1,CO4**

Learning Resources
Text Books
Software Project Management, Walker Royce Pearson Education, 2009
References
1. Software Project Management, Bob Hughes and Mike Cotterell Tata McGraw- Hill Edition. 2. Software Project Management in Practice, Pankajjalot, Pearson Education

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INFORMATION TECHNOLOGY

DEEP LEARNING
(Professional Elective –III)

Course Code	20IT4701D	**Year**	IV	**Semester**	I
Course Category	**PE3**	**Branch**	IT	**Course Type**	Theory
Credits	3	**L-T-P**	3-0-0	**Prerequisites**	Machine learning and neural networks
Continuous Internal Evaluation:	30	**Semester End Evaluation:**	70	**Total Marks:**	100

Course Outcomes		**Blooms Taxonomy Level**
Upon Successful completion of course, the student will be able to		
CO1	Understand the fundamental techniques and tools required to train a deep learning models	L2
CO2	Analyze deep learning data types and model architectures	L3
CO3	Analyze artificial neural network optimization and regularization in deep learning approaches	L3
CO4	Train and apply fully connected deep neural networks	L3

Strength of Correlation between CO – PO, CO- PSO in scale of 1-3

1: Slight (low), 2: Moderate (medium) 3: Substantial (High)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3													
CO2		3												
CO3		3												
CO4				3									3	3
Overall course	3	3		3									3	3

Syllabus		
Unit No	**Contents**	**Mapped CO**
I	**Introduction to Tensor Flow: Computational** Graph, Key highlights, Creating a Graph, Regression example, Gradient Descent, Tensor Board, Modularity, Sharing Variables, Keras Perceptrons: What is a Perceptron, XOR Gate	**CO1**

II	**Activation Functions:** Sigmoid, ReLU, Hyperbolic Fns, Softmax Artificial Neural Networks: Introduction, Perceptron Training Rule, Gradient Descent Rule	**CO1, CO2**
III	**Gradient Descent and Back propagation:** Gradient Descent, Stochastic Gradient Descent, Back propagation, Some problems in ANN Optimization and Regularization: Overfitting and Capacity, Cross Validation, Feature Selection, Regularization, Hyper parameters	**CO1, CO2**
IV	**Introduction to Convolutional Neural Networks**: Introduction to CNNs, Kernel filter, Principles behind CNNs, Multiple Filters, CNN applications Introduction to Recurrent Neural Networks: Introduction to RNNs, Unfolded RNNs, Seq2Seq RNNs, LSTM, RNN applications	**CO1, CO2, CO3**
V	**Deep Learning applications:** Image Processing, Natural Language Processing, Speech Recognition, Video Analytics	**CO1, CO2, CO4**

Learning Resources

Text Books

1. Goodfellow, I., Bengio,Y., and Courville, A., Deep Learning, MIT Press, 2016.

References

1. Bishop, C. ,M., Pattern Recognition and Machine Learning, Springer, 2006.
2. Yegnanarayana, B., Artificial Neural Networks PHI Learning Pvt. Ltd, 2009.
3. Golub, G.,H., and Van Loan,C.,F., Matrix Computations, JHU Press,2013.
4. Satish Kumar, Neural Networks: A Classroom Approach, Tata McGraw-Hill Education, 2004.

e-Resources and other Digital Material

1) https://keras.io/datasets/
2) http://deeplearning.net/tutorial/deeplearning.pdf
3) https://arxiv.org/pdf/1404.7828v4.pdf
4) https://github.com/lisa-lab/DeepLearningTutorials

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(AUTONOMOUS)
INFORMATION TECHNOLOGY

MINING MASSIVE DATASETS
(Professional Elective –III)

Course Code	20IT4701E	**Year**	IV	**Semester**	I
Course Category	**PE3**	**Branch**	IT	**Course Type**	Theory
Credits	3	**L-T-P**	3-0-0	**Prerequisites**	Data mining
Continuous Internal Evaluation:	30	**Semester End Evaluation:**	70	**Total Marks:**	100

<u>Strength of Correlation between CO – PO, CO- PSO in scale of 1-3</u>

1: Slight (low), 2: Moderate (medium) 3: Substantial (High)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3													
CO2		3												
CO3		3												
CO4				3									3	3
Overall course	3	3		3									3	3

Course Outcomes		**Blooms Taxonomy Level**
Upon Successful completion of course, the student will be able to		
CO1	Recollecting fundamentals of data mining.	L2
CO2	Apply the concept of Map reduce and data streams for storing and processing of massive data sets	L3
CO3	Analyze the issues underlying the effective applications of massive data sets	L4
CO4	Evaluate different clustering algorithms and analyze various decomposition techniques	L4

Syllabus		
Unit No	**Contents**	**Mapped CO**
I	**Data Mining: Introduction,** Statistical Modeling, Machine Learning, Computational Approaches to Modeling, Feature Extraction, Statistical Limits on Data Mining, Hash Functions, Indexes, Natural Logarithms, Power Laws.	**CO1**
II	**Map Reduce and the New Software Stack:** Distributed File Systems, Map Reduce, Algorithms Using MapReduce, Extensions to MapReduce, Complexity Theory for MapReduce.	**CO2**
III	**Mining Data Streams:** The Stream Data Model, Sampling Data in a Stream, Filtering Streams, Counting Distinct Elements in a Stream, Counting Ones in a Window, Decaying Windows.	**CO1,CO2**
IV	**Frequent Item sets:** The Market-Basket Model, Market Baskets and the A-Priori Algorithm, Handling Larger Datasets in Main Memory, Limited-Pass Algorithms, Counting Frequent Items in a Stream.	**CO1,CO3**
V	**Clustering:** Introduction to Clustering Techniques, Hierarchical Clustering, K-means Algorithms, The CURE Algorithm, Clustering in Non-Euclidean Spaces, and Clustering for Streams and Parallelism. **Dimensionality Reduction:** Eigen values and Eigenvectors of Symmetric Matrices, Principal-Component Analysis, Singular-Value Decomposition, CUR Decomposition	**CO1,CO4**
Learning Resources		
Text Books		
1.Mining of Massive Datasets - Jure Leskovec, Anand Rajaraman, Jeffrey D. Ullman" (LaTeX)		

PVP SIDDHARTHA INSTITUTE OF TECHNOLOGY, KANURU, VIJAYAWADA
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INFORMATION TECHNOLOGY

ADHOC NETWORKS
(Professional Elective –IV)

Course Code	20IT4702A	**Year**	IV	**Semester**	I
Course Category	PE IV	**Branch**	IT	**Course Type**	Theory
Credits	3	**L-T-P**	3-0-0	**Prerequisites**	Computer Networks
Continuous Internal Evaluation :	30	**Semester End Evaluation:**	70	**Total Marks:**	100

Course Outcomes		**Blooms Taxonomy Level**
Upon Successful completion of course, the student will be able to		
CO1	Understand the principles of Ad Hoc wireless networks.	L2
CO2	Apply principles of different access control protocols.	L3
CO3	Use the concepts of different routing protocols in real scenarios.	L3
CO4	Analyze the concepts of transport layer and security protocols.	L4

Contribution of Course Outcomes towards achievement of Program Outcomes & Strength of Correlations (H:High,M:Medium,L:Low)

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	3												3	
CO2	3												3	
CO3		3											3	
CO4		3											3	

Syllabus		
Unit No	**Contents**	**Mapped CO**
I	**Ad Hoc Wireless Networks: Introduction**-Cellular and Ad Hoc Wireless Networks, Applications of Ad Hoc Wireless Networks, Issues in Ad Hoc Wireless Networks- Medium Access Scheme, Routing, Multicasting, Transport Layer Protocols, Pricing Scheme, Quality of Service Provisioning, Ad Hoc Wireless Internet.	**CO1**
II	**Mac Protocols For Ad Hoc Wireless Networks** – Design Goals of A Mac Protocol For Ad Hoc Wireless Networks, Classifications of MAC protocols, Contention-Based Protocols- MACAW: A Media Access Protocol for Wireless LANs, Floor Acquisition Multiple Access Protocols, Contention-Based Protocols With Reservation Mechanisms- Distributed Packet Reservation Multiple Access Protocol, Collision Avoidance Time Allocation Protocol.	**CO1** **CO2**
III	**Routing Protocols:** Issues In Designing A Routing Protocol For Ad Hoc Wireless Networks, Classifications of Routing Protocols, Table-Driven Routing Protocols-Destination Sequenced Distance-Vector Routing Protocol, Wireless Routing Protocol, On-Demand Routing Protocols-Dynamic Source Routing Protocol, Ad Hoc On-Demand Distance Vector Routing Protocol.	**CO1CO3**
IV	**Multicast Routing In Ad Hoc Wireless Networks**: Issues in designing multicast routing protocols, Classification of Multicast Routing Protocols, Tree-Based Multicast Routing Protocols-Bandwidth-Efficient Multicast Routing Protocol, Multicast Routing Protocol Based on Zone Routing, Mesh-Based Multicast Routing Protocols-On-Demand Multicast Routing Protocol, Dynamic Core-Based Multicast Routing Protocol.	**CO1CO3**
V	**Transport Layer And Security Protocols For Ad Hoc Wireless Networks:** Issues In Designing A Transport Layer Protocol For Ad Hoc Wireless Networks, Design Goals of A Transport Layer Protocol For Ad Hoc Wireless Networks, Classification of Transport Layer Solutions, Network Security Requirements, Issues and Challenges in Security Provisioning, Network Security Attacks-Network Layer Attacks.	**CO1** **CO4**

Learning Resources
Text Books
1. C.Siva Ram Murthy, B.S. Manoj, "Ad hoc wireless networks-Architectures and protocols" Pearson Education, 2014
References
1. Stefano Basagni, Marco Conti, "Mobile ad hoc networking", Wielyinterscience 2004 2. Charles Kadushin , Understanding Social Networks: Theories, Concepts, and Findings
E- Resources and other Digital Material 1. https://www.coursera.org/learn/social-network-analysis 2. https://onlinecourses.nptel.ac.in/noc20_cs78/

PVP SIDDHARTHA INSTITUTE OF TECHNOLOGY, KANURU, VIJAYAWADA
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INFORMATION TECHNOLOGY

SERVICE ORIENTED ARCHITECTURE
(Professional Elective –IV)

Course Code	20IT4702B	**Year**	IV	**Semester**	I
Course Category	PE - IV	**Branch**	IT	**Course Type**	Theory
Credits	3	**L-T-P**	3-0-0	**Prerequisites**	JAVA, Web Technologies
Continuous Internal Evaluation :	30	**Semester End Evaluation:**	70	**Total Marks:**	100

Course Outcomes		**Blooms Taxonomy Level**
Upon Successful completion of course, the student will be able to		
CO1	Understand basic principles, functionalities, standards, registering and discovery of web services in SOA.	L2
CO2	Use the technologies and systems for enabling infrastructure of SOA.	L3
CO3	Apply SOAP specification and data structures to provide a general protocol for Web services.	L3
CO4	Analyze the concepts related to WSDL and UDDI framework.	L4

Contribution of Course Outcomes towards achievement of Program Outcomes & Strength of Correlations (H:High, M:Medium, L:Low)

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	3												3	
CO2	3						3						3	
CO3		3											3	
CO4		3											3	

Syllabus		
Unit No	**Contents**	**Mapped CO**
I	**Web services basics**: Introduction, The concept of software as a service, A more complete definition of Web services, Characteristics of Web services, Service interface and implementation, The service-oriented architecture, The Web services technology stack, Quality of service (QoS), Web services interoperability, Web services versus components, Impact and shortcomings of Web services	**CO1**
II	**Distributed computing infrastructure**: Distributed computing and Internet protocols, The client–server model, Characteristics of inter process communication, Synchronous forms of middleware, Asynchronous forms of middleware, Request/reply messaging, Message-oriented middleware, Transaction-oriented middleware, Enterprise application and e-business integration	**CO1** **CO2**
III	**Brief overview of XML**: XML document structure, URIs and XML namespaces, Defining structure in XML documents, XML schemas reuse, Document navigation and transformation	**CO1** **CO2**
IV	**SOAP:** Simple Object Access Protocol: Inter-application communication and wire protocols, SOAP as a messaging protocol, Structure of a SOAP message, The SOAP communication model, Error handling in SOAP, SOAP over HTTP 140, Advantages and disadvantages of SOAP	**CO1** **CO3**
V	**Describing Web services**: Why is a service description needed?, WSDL: Web Services Description Language, Using WSDL to generate client stubs, Non-functional descriptions in WSDL **Registering and discovering Web services:** Service registries, Service discovery, UDDI data structures, WSDL to UDDI mapping model, The UDDI API, Querying the UDDI model, UDDI usage model and deployment variants	**CO1** **CO4**

Learning Resources
Text Books
1. Web Services & SOA Principles and Technology, Second Edition, Michael P. Papazoglou, 2012.
References
1. Developing J2EE Web Services, R. Nagappan, R. Skoczylas, R.P. Sriganesh, Wiley India. 2. Sandeep Chatterjee, James Webber, Developing Enterprise Web Services, An Architect's Guide, Pearson Education, 2005. 3. Dan Woods and Thomas Mattern, Enterprise SOA Designing IT for Business Innovation, O'REILLY, 2006. 4. Frank Cohen, FastSOA, Elsevier, 2007. 5. Jeff Davies, The Definitive Guide to SOA, Academic Press, 2007
E- Resources and other Digital Material 1. https://www.coursera.org/learn/service-oriented-architecture

PVP SIDDHARTHA INSTITUTE OF TECHNOLOGY, KANURU, VIJAYAWADA
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INFORMATION TECHNOLOGY

AGILE SOFTWARE DEVELOPMENT

(Professional Elective –IV)

Course Code	20IT4702C	**Year**	IV	**Semester**	I
Course Category	PE - IV	**Branch**	IT	**Course Type**	Theory
Credits	3	**L-T-P**	3-0-0	**Prerequisites**	Software Engineering
Continuous Internal Evaluation :	30	**Semester End Evaluation:**	70	**Total Marks:**	100

Course Outcomes		**Blooms Taxonomy Level**
Upon Successful completion of course, the student will be able to		
CO1	Understand the basics of Agile methods in various development environments.	L2
CO2	Apply different software development processes in real situations	L3
CO3	Use Agile tools for software development processes in different scenarios	L3
CO4	Analyze different software development methods	L4

Contribution of Course Outcomes towards achievement of Program Outcomes & Strength of Correlations (H:High, M:Medium, L:Low)														
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	3												3	
CO2	3										3			3
CO3			3		3						3			
CO4	3		3								3			3

Syllabus		
Unit No	**Contents**	**Mapped CO**
I	**INTRODUCTION:** What is Agile? The Agile manifesto, agile methods, XP: Extreme Programming, DSDM, SCRUM, Feature-Driven Development, modeling misconceptions, agile modeling, tools of misconceptions, updating agile models.	**CO1**
II	**Extreme Programming**: Introduction, core XP values, the twelve XP practices, about extreme programming? Planning XP projects, test first coding, making pair programming work.	**CO1 CO2 CO4**
III	**Agile Modelling and XP:** Introduction, the fit, common practices, modelling specific practices, XP objections to agile modelling, agile modelling and planning XP projects, XP implementation phase.	**CO1 CO2 CO4**
IV	**Feature-Driven Development:** Introduction, incremental software development, Regaining Control: The motivation behind FDD, planning an iterative project, architecture centric, FDD and XP.	**CO1 CO2 CO4**
V	**Agile Methods with RUP and PRINCE2 and Tools and Obstacles:** Agile modeling and RUP, FDD and RUP, agile methods and prince2, tools to help with agile development, Eclipse: An agile IDE, obstacles to agile software development, management intransigence, the failed project syndrome, contractual difficulties, familiarity with agility.	**CO1 CO3 CO4**

Learning Resources
Text Books
1. Craig Larman, Agile and Iterative Development, Addison-Wesley, Pearson Education, 2004.
References
1. Agile Software Development, Principles, Patterns and Practices, Pearson New International Edition, 2013. 2. Pearson, Robert C. Martin, Juli, James Shore, Chromatic, the Art of Agile Development, O'Reilly Media, 2013.
E-Resources and other Digital Material 1. https://www.udacity.com/course/agile-software-development-nanodegree--nd144

PVP SIDDHARTHA INSTITUTE OF TECHNOLOGY, KANURU, VIJAYAWADA
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INFORMATION TECHNOLOGY

NATURAL LANGUAGE PROCESSING

(Professional Elective –IV)

Course Code	20IT4702D	**Year**	IV	**Semester**	I
Course Category	PE - IV	**Branch**	IT	**Course Type**	Theory
Credits	3	**L-T-P**	3-0-0	**Prerequisites**	Data Mining
Continuous Internal Evaluation :	30	**Semester End Evaluation:**	70	**Total Marks:**	100

Course Outcomes		**Blooms Taxonomy Level**
Upon Successful completion of course, the student will be able to		
CO1	Understand the theoretical foundations of natural language processing in linguistics and formal language theory.	L2
CO2	Apply algorithms to solve text categorization tasks.	L3
CO3	Use concepts of semantic and syntactic analysis in real world NLP applications.	L3
CO4	Analyze NLP tasks using existing algorithms and frameworks for various applications.	L4

Contribution of Course Outcomes towards achievement of Program Outcomes & Strength of Correlations (H:High, M:Medium, L:Low)

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	3												3	
CO2		3			3								3	
CO3			3											3
CO4	3													3

Syllabus		
Unit No	**Contents**	**Mapped CO**
I	**Regular Expressions, Text Normalization, Edit Distance-** Regular Expression, Words, Corpora, Text Normalization, Minimum Edit Distance. N-Gram Language Models-NGrams, Evaluating Language Models, Generalization and Zeros, Smoothing, Kneser-Ney Smoothing, The web and stupid Backoff, Advanced Perplexity’s Relation to Entropy.	**CO1** **CO4**

II	**Naive Bayes and Sentiment Classification**: Naive Bayes Classifiers, Training the Naive Bayes Classifier, Worked example, Optimizing for Sentiment Analysis, Naive Bayes for other text classification tasks, Naive Bayes as a Language Model, Evaluation: Precision, Recall, F-measure, Test sets and Cross-validation, Statistical Significance Testing, Avoiding Harms in Classification	**CO1** **CO2** **CO4**
III	**Vector Semantics and Embeddings-** Lexical Semantics, Vector Semantics, Words and Vectors, Cosine for measuring similarity, TF-IDF: Weighing terms in the vector, Applications of the TF-IDF vector model, Word2vec, Visualizing Embeddings, Semantic properties of embeddings, Bias and Embeddings, Evaluating Vector Models.	**CO1** **CO3** **CO4**
IV	**Sequence Labeling for Parts of Speech and Named Entities-** English Word Classes, Part-of-Speech Tagging, Named Entities and Named Entity Tagging, HMM Part-of-Speech Tagging, Conditional Random Fields (CRFs), Evaluation of Named Entity Recognition	**CO1** **CO3** **CO4**
V	**Applications of NLP-** Question Answering Information Retrieval IR-based Factoid Question Answering, Entity Linking, Knowledge-based Question Answering, Using Language Models to do QA, Classic QA Models, Evaluation of Factoid Answers, Chatbots & Dialogue Systems, Properties of Human Conversation, Chatbots , GUS: Simple Frame-based Dialogue Systems, The Dialogue-State Architecture, Evaluating Dialogue Systems, Dialogue System Design	**CO1** **CO2** **CO3** **CO4**

Learning Resources

Text Books

1. Speech and Language Processing: An introduction to Natural Language Processing, Computational Linguistics and Speech Recognition by Daniel Jurafsky and James H Martin, 3rd Edition, Prentice Hall, 2020.
2. Natural Language Processing: An information Access Perspective by Kavi Narayana Murthy, Ess Publications, 2006.

References

1. Applied Text Analysis with Python by Benjamin Bengfort, Tony Ojeda, Rebecca Bilbro, O'Reilly Media, June 2018.
2. Natural Language Processing Recipes by Akshay Kulkarni, Adarsha Shivananda, Apress, 2019

E-Resources and other Digital Material

1. Natural Language Processing by Pawan Goyal, IIT Kharagpur, https://swayam.gov.in/nd1_noc19_cs56/preview
2. Natural Language Processing offered by deeplearning.ai on Coursera https://www.coursera.org/specializations/natural-language-processing

PVP SIDDHARTHA INSTITUTE OF TECHNOLOGY, KANURU, VIJAYAWADA
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INFORMATION TECHNOLOGY

BIG DATA ANAYTICS

(Professional Elective –IV)

Course Code	20IT4702E	**Year**	IV	**Semester**	I
Course Category	PE -IV	**Branch**	IT	**Course Type**	Theory
Credits	3	**L-T-P**	3-0-0	**Prerequisites**	DBMS, Data Mining
Continuous Internal Evaluation :	30	**Semester End Evaluation:**	70	**Total Marks:**	100

Course Outcomes		**Blooms Taxonomy Level**
Upon Successful completion of course, the student will be able to		
CO1	Understand the concepts of Hadoop, Cassandra, Pig and Hive.	L2
CO2	Apply the knowledge of Hadoop and Cassandra for solving real time problems	L3
CO3	Use the concepts Pig and Hive for big data analysis	L3
CO4	Analyze the appropriate concepts of bigdata to solve a given application.	L4

Contribution of Course Outcomes towards achievement of Program Outcomes & Strength of Correlations (H:High,M:Medium,L:Low)

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	3											3	3	
CO2	3	3	3									3	3	
CO3	3		3									3	3	
CO4	3		3									3	3	

Syllabus		
Unit No	**Contents**	**Mapped CO**
I	**Types of Digital Data**: Classification of Digital Data. Introduction to BigData: Characteristic of Data, Evolution of BigData, Definition of Big Data, Challenges with Big Data, What is BigData?. Big Data Analytics: Where dowe Begin? What is BigData Analytics?, What Big Data Analytics isn't?, Classification of Analytics, Terminologies Used in Big Data Environments. The BigData Technology Landscape: NoSQL	**CO1**
II	**Introduction to Cassandra**: Apache Cassandra – An Introduction Features of Cassandra, CQL Data Types, CQLSH, Key spaces, CRUD ,Collections, Using a Counter, Time to Live, Alter Commands, Import and Export.	**CO1** **CO2** **CO4**
III	**Hadoop Overview**: HDFS(Hadoop Distributed File System), Processing Data with Hadoop, Managing Resources and Applications with Hadoop YARN(Yet another Resource Negotiator). Introduction to MAPREDUCE Programming: Introduction, Mapper, Reducer, Combiner, Partitioner, Searching, Sorting, Compression.	**CO1** **CO2** **CO4**
IV	**Introduction to Hive**: Introduction – Architecture - Data Types - File Formats - Hive Query Language Statements – Partitions – Bucketing – Views - Sub-Query – Joins – Aggregations - Group by and Having - RCFile Implementation - Hive User Defined Function - Serialization and Deserialization.	**CO1** **CO3** **CO4**
V	**Pig**: Introduction - Anatomy – Features – Philosophy - Use Case for Pig - Pig Latin Overview - Pig Primitive Data Types - Running Pig - Execution Modes of Pig - HDFS Commands - Relational Operators - Eval Function - Complex Data Types - Piggy Bank - User-Defined Functions - Word Count Example using Pig.	**CO1** **CO3** **CO4**

Learning Resources

Text Books

1. Big Data and Analytics, Seema Acharya, Subhashini Chellappan ,First Edition,Wiley,2015

References

1. Tom White, Hadoop: The Definitive Guide, FourthEdition,O'Reilly,2015
2. Hrushikesha Mohanty, Prachet Bhuyan, Deepak Chenthati Editors Big Data A PremierSpringer Volume 11
3. Learning Spark Lightning-Fast Big Data Analysis, Andy Konwinski, Holden Karau, MateiZaharia, Patrick Wendell , First Edition, O'Reilly, 2015
4. Big Data Analytics, Radha Shankarmani, M VijayaLakshmi, Second Edition, Wiley, 2017

E- Resources and other Digital Material

1. https://www.coursera.org/courses?query=introduction%20to%20big%20data%20analytics

2. https://www.edx.org/learn/big-data

3. https://swayam.gov.in/nd1_noc20_cs46/

PVP SIDDHARTHA INSTITUTE OF TECHNOLOGY, KANURU, VIJAYAWADA
(AUTONOMOUS)
INFORMATION TECHNOLOGY

FUNDAMENTALS OF BLOCK CHAIN TECHNOLOGY

(Professional Elective –V)

Course Code	20IT4703A	**Year**	IV	**Semester**	I
Course Category	PE 5	**Branch**	IT	**Course Type**	Theory
Credits	3	**L-T-P**	3-0-0	**Prerequisites**	Computer Networks
Continuous Internal Evaluation :	30	**Semester End Evaluation:**	70	**Total Marks:**	100

Course Outcomes		
Upon successful completion of the course, the student will be able to		
CO1	Understand the key dimensions of Blockchain Technology	**L2**
CO2	Apply the principles of Block chain for a given application.	**L3**
CO3	Apply the features of Ethereum and Hyperledger to develop various applications	**L3**
CO4	Analyze the given scenario and design a block chain based solution.	**L4**

Contribution of Course Outcomes towards achievement of Program Outcomes & Strength of correlations (3:Substantial, 2: Moderate, 1:Slight)

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	3													
CO2	3												3	
CO3	3												3	
CO4		3							3	3			3	

Syllabus		
Unit No.	**Contents**	**Mapped CO**
I	**Blockchain 101:** Distributed systems, History of Blockchain and bitcoin, Introduction to Blockchain, Consensus, CAP theorem and Blockchain.	**CO1,CO2**
II	**Decentralization**: Decentralization using Blockchain, Methods of decentralization, Routes to decentralization, Blockchain and full ecosystem decentralization, pertinent Terminology.	**CO1,CO2,CO4**
III	**Cryptography and Technical Foundations:** Cryptographic primitives, Asymmetric cryptography, Cryptographic constructs and Blockchain technology **Introducing Bitcoin**: Overview, Cryptographic keys, transactions, Blockchain, Mining.	**CO1,CO2,CO4**
IV	**Ethereum 101:**Overview,The Ethereum Network, Components of the Ethereum ecosystem, The Ethereum Virtual Machine **Smart Contracts:** Definition, Ricardian Contracts, Smart Contract Templates, Oracles, Deploying Smart Contracts	**CO1,CO3,CO4**
V	**Hyper ledger:** Overview, Hyper ledger Reference Architecture, Hyperledger fabric Blockchain-Outside of Currencies: Internet of Things, Government, Health, Finance, Media.	**CO1,CO3,CO4**

Learning Resources
Text Book
1.Mastering Block chain - Distributed ledgers, decentralization and smart contracts explained, Imran Bashir, Third Edition, Packt Publishing Ltd.
References
1.Bitcoin and Crypto currency Technologies, Arvind Narayanan, Joseph Bonneau, Edward Felten, Andrew Miller, Steven Gold feder, Princeton University, 2016. **2**. Mastering Bitcoin: Unlocking Digital Crypto currencies, Andreas M. Antonopoulos, First Edition, 2014, O'Reilly Media.
e-Resources and other Digital Material
1. https://www.coursera.org/specializations/blockchain 2. https://nptel.ac.in/courses/106105184/

PVP SIDDHARTHA INSTITUTE OF TECHNOLOGY, KANURU, VIJAYAWADA
(AUTONOMOUS)
INFORMATION TECHNOLOGY

CLOUD SECURITY AND PRIVACY
(Professional Elective –V)

Course Code	20IT4703B	**Year**	IV	**Semester**	I
Course Category	PE 5	**Branch**	IT	**Course Type**	Theory
Credits	3	**L-T-P**	3-0-0	**Prerequisites**	Cloud Computing
Continuous Internal Evaluation :	30	**Semester End Evaluation:**	70	**Total Marks:**	100

Course Outcomes		**Blooms Taxonomy Level**
Upon Successful completion of course, the student will be able to		
CO1	Understand the basic components of cloud & Security in the cloud	L2
CO2	Illustrate the Infrastructure Security, Data Security, storage and security management in the cloud.	L3
CO3	Understand the concepts of Identity and Access Management	L2
CO4	Illustrate the privacy issues in could environment	L3

Contribution of Course Outcomes towards achievement of Program Outcomes &Strength of correlations(3:Substantial,2: Moderate,1:Slight)

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	3												3	
CO2	3												3	
CO3	3												3	
CO4	3												3	

Syllabus		
Unit No	**Contents**	**Mapped CO**
I	**What Is Cloud Computing:** Cloud Computing Defined, The SPI Framework for Cloud Computing, Relevant Technologies in Cloud Computing, The Traditional Software Model,The Cloud Services Delivery Model, Cloud Deployment Models, Key Drivers to Adopting the Cloud, The Impact of Cloud Computing on Users, Governance in the Cloud, Barriers to Cloud Computing Adoption in the Enterprise.	**CO1**
II	**Infrastructure Security:** Infrastructure Security: The Network Level, Infrastructure Security: The Host Level, Infrastructure Security: The Application Level **Data Security and Storage:** Aspects of Data Security, Data Security Mitigation, Provider Data and Its Security	**CO1** **CO2**
III	**Identity and Access Management:** Trust Boundaries and IAM, Why IAM?,IAM Challenges, IAM Definitions, IAM Architecture and Practice, Getting Ready for the Cloud, Relevant IAM Standards and Protocols for Cloud Services, IAM Practices in the Cloud, Cloud Authorization Management, Cloud Service Provider IAM Practice	**CO1** **CO3**
IV	**Security Management in the Cloud:** Security Management Standards, Security Management in the Cloud Availability Management, SaaS Availability Management PaaS Availability Management, IaaS Availability Management, Access Control, Security Vulnerability, Patch, and Configuration Management	**CO1** **CO2**
V	**Privacy** : What Is Privacy, What Is the Data Life Cycle, What Are the Key Privacy Concerns in the Cloud, Who Is Responsible for Protecting Privacy, Changes to Privacy Risk Management and Compliance in Relation to Cloud Computing, Legal and Regulatory Implications, U.S. Laws and Regulations, International Laws and Regulations	**CO1** **CO4**

Learning Resources
Text Books
1. Tim Mather, Subra Kumara swamy,Shahed Latif,“Cloud Security and Privacy: An Enterprise Perspective on Risks and Compliance” O'ReillyMedia; 1edition [ISBN:0596802765], 2009
References
1. RonaldL.Krutz,RussellDeanVines,“CloudSecurity”[ISBN:0470589876],2010. 2. John Rittinghouse, James Ransome, “Cloud Computing” CRC Press; 1 edition [ISBN:1439806802], 2009. 3. J.R.("Vic")Winkler,“SecuringtheCloud”Syngress[ISBN:1597495921]2011 1stEdition,KindleEdition
E- Resources and other Digital Material

PVP SIDDHARTHA INSTITUTE OF TECHNOLOGY, KANURU, VIJAYAWADA
(AUTONOMOUS)
INFORMATION TECHNOLOGY

SOFTWARE TESTING METHODOLOGIES
(Professional Elective –V)

Course Code	20IT4703C	**Year**	IV	**Semester**	I
Course Category	PE 5	**Branch**	IT	**Course Type**	Theory
Credits	3	**L-T-P**	3-0-0	**Prerequisites**	Software engineering
Continuous Internal Evaluation :	30	**Semester End Evaluation:**	70	**Total Marks:**	100

Course Outcomes		**Blooms Taxonomy Level**
Upon Successful completion of course, the student will be able to		
CO1	Understand the basic concepts of software testing	L2
CO2	Apply Dynamic Testing Techniques and validation activities	L3
CO3	Apply software test management practices	L3
CO4	Gain knowledge on automation testing	L2
CO5	Analyze various testing strategies for a given application (Assignment)	L4

Contribution of Course Outcomes towards achievement of Program Outcomes &Strength of correlations(3:Substantial,2: Moderate,1:Slight)

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	3												3	
CO2	3												3	
CO3	3												3	
CO4	3												3	
CO5		3							3	3				3

Syllabus		
Unit No	**Contents**	**Mapped CO**
I	**Introduction to Software Testing:** Introduction, evolution of software testing, software testing-Myths and Facts, goals of software testing, Psychology for software testing, Software Testing Definitions, Model of software testing, Effective Software Testing Vs Exhaustive Software Testing, Software Testing Terminology, Software Testing Life Cycle(STLC), Testing methodology.	**CO1**
II	**Dynamic testing: Black-Box Testing Techniques:** Boundary value analysis, equivalence class testing. **White-box testing**: Need of White Box Testing, Logic Coverage Criteria, Basis Path Testing, Loop Testing, Data Flow Testing.	**CO1, CO2, CO5**
III	**Validation activities**: Unit validation testing, integration Testing, function Testing, system Testing, acceptance testing. **Regression Testing:** Progressive Vs Regression Testing, objectives, types, defining regression test problem, regression testing techniques.	**CO1, CO2**
IV	**Test management**: Test organization, structure of testing group, test planning, Detailed test design and test specification. **Software Metrics:** Need of Software Measurement, Definition of Software Metrics, Classification of Software Metrics, Entities to be measured, Size Metrics.	**CO1 CO3**
V	**Automation and Testing Tools:** Need for automation, categorization of testing tools, selection of testing tools, Cost incurred, Guidelines for automated testing, overview of some commercial testing tools.	**CO4**

Learning Resources
Text Books
1. Naresh Chauhan, Software Testing: Principles and Practices, 1/e, Oxford UniversityPress, 2010
References
1. William E. Perry, Effective Methods for Software Testing, 3/e, Wiley, 2006. 2. Paul C. Jorgensen, Software Testing: A Craftsman's Approach, 3/e, Auerbach publication, 2015.
E- Resources and other Digital Material
https://www.coursera.org/courses?query=software%20testing https://nptel.ac.in/courses/106101163

PVP SIDDHARTHA INSTITUTE OF TECHNOLOGY, KANURU, VIJAYAWADA
(AUTONOMOUS)
INFORMATION TECHNOLOGY

SOFT COMPUTING
(Professional Elective –V)

Course Code	20IT4703D	**Year**	IV	**Semester**	I
Course Category	PE-5	**Branch**	IT	**Course Type**	Theory
Credits	3	**L-T-P**	3-0-0	**Prerequisites**	Mathematics, Probability and Statistics
Continuous Internal Evaluation :	30	**Semester End Evaluation:**	70	**Total Marks:**	100

Course Outcomes		**Blooms Taxonomy Level**
Upon Successful completion of course, the student will be able to		
CO1	Understand the basic concepts of soft computing, Artificial Neural Network techniques and their applications	L2
CO2	Illustrate the concepts of Supervised Learning Network, Un Supervised Learning Network	L2
CO3	Interpret the concepts of fuzzy logic and fuzzy relations	L2
CO4	Apply genetic algorithms to solve engineering problems	L3

Contribution of Course Outcomes towards achievement of Program Outcomes &Strength of correlations(3:Substantial,2: Moderate,1:Slight)

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	3												3	
CO2	3												3	
CO3	3					3							3	
CO4	3					3							3	

Syllabus		
Unit No	**Contents**	**Mapped CO**
I	**Introduction:** Neural Networks, Application scope of neural networks, Application scope of Neural Networks, Fuzzy logic, Genetic Algorithm, Hybrid Systems, Soft computing. **Artificial Neural Network:** An Introduction, Fundamental Concept, Evolution of Neural Networks, Basic models Artificial neural network, Important Terminologies of ANNs, McCulloch-Pitts Neuron, Linear Separability, Hebb Network.	**CO1**
II	**Supervised Learning Network**: Introduction, Perceptron Networks, Adaptive Linear Neuron, Multiple adaptive Linear neurons, Back Propagation Network. **Unsupervised Learning Network**: Introduction, Fixed weight Competitive Nets, Counter Propagation Networks, Adaptive Resonance Theory Network.	**CO1** **CO2**
III	**Introduction to Fuzzy Logic, Classical Sets and Fuzzy Sets:** Introduction to Fuzzy Logic, Classical Sets(Crisp Sets):Operations on Classical Sets, Fuzzy Sets: Fuzzy Set Operations. Classical Relations and Fuzzy Relation**:** Introduction, Cartesian Product of Relation, Classical Relation, Fuzzy Relations.	**CO1** **CO3**
IV	**Genetic Algorithm:** Introduction, Biological background, Traditional Optimization and Search Techniques: Gradient-Based Local Optimization method, Random Search, Stochastic Hill Climbing, Simulated Annealing, Symbolic Artificial Intelligence Genetic Algorithm and Search space, Genetic Algorithm Vs Traditional Algorithms.	**CO1** **CO4**
V	**Basic Terminologies in Genetic Algorithm**: Simple GA, General Genetic Algorithm, Operators in Genetic Algorithm: Encoding, Selection, Crossover(Recombination),Mutation, Stopping Condition for Genetic Algorithm Flow: Best Individual, Worst Individual, Sum of Fitness, Median Fitness	**CO1** **CO4**

Learning Resources
Text Books
1. Principles of Soft Computing, S.N.Sivanandam, S.N.Deepa, Wiley India Pvt. Ltd., Second Edition, 2011.
References
1. Principles of Soft Computing, S.N.Sivanandam, S.N.Deepa, Wiley India Pvt. Ltd., 2018, Paperback. 2. Genetic Algorithms: Search and Optimization. E. Goldberg 3. Fuzzy Sets and Fuzzy Logic-Theory and Applications, George J. Klir and Bo Yuan, Prentice Hall, 2015, Paperback.
E- Resources and other Digital Material
1. https://nptel.ac.in/courses/106/105/106105173/ 2. https://cse.iitkgp.ac.in/~dsamanta/courses/sca/index.html#resourceS

PVP SIDDHARTHA INSTITUTE OF TECHNOLOGY, KANURU, VIJAYAWADA
(AUTONOMOUS)
INFORMATION TECHNOLOGY

DATA SCIENCE
(Professional Elective –V)

Course Code	20IT4703E	**Year**	IV	**Semester**	I
Course Category	PE-5	**Branch**	IT	**Course Type**	Theory
Credits	3	**L-T-P**	3-0-0	**Prerequisites**	Data Mining Concepts
Continuous Internal Evaluation :	30	**Semester End Evaluation:**	70	**Total Marks:**	100

Course Outcomes		**Blooms Taxonomy Level**
Upon Successful completion of course, the student will be able to		
CO1	Understand the basic terms of Data Science.	L2
CO2	Understand the Data Science process.	L2
CO3	Explain how to Handle large data on a single computer	L2
CO4	Apply Data Visualization, plotting techniques.	L3

Contribution of Course Outcomes towards achievement of Program Outcomes &Strength of correlations(3:Substantial,2: Moderate,1:Slight)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3												3	
CO2	3												3	
CO3	3												3	
CO4	3												3	

Syllabus

Unit No	Contents	Mapped CO

I	**Data science in a big data world :** Benefits and uses of data science and big data **Facets of data:** Structured data, Unstructured data, Natural language, Machine-generated data, Graph-based or network data, Audio, image, and video , Streaming data **The data science process:** Setting the research goal , Retrieving data, Data preparation, Data exploration, Data modeling or model building, Presentation and automation	**CO1**
II	**The data science process : Overview of the data science process**: Don't be a slave to the process, **Defining research goals and creating a project charter:** Spend time understanding the goals and context of your research, Create a project charter **Retrieving data:** Start with data stored within the company, Don't be afraid to shop around, Do data quality checks now to prevent problems later	**CO1** **CO2**
III	**Cleansing, integrating, and transforming data:** Cleansing data, Correct errors as early as possible, Combining data from different data sources, Transforming data **Exploratory data analysis**, **Build the models:** Model and variable selection, Model execution, Model diagnostics and model comparison	**CO1** **CO2**
IV	**Handling large data on a single computer :**The problems you face when handling large data **General techniques for handling large volumes of data:** Choosing the right algorithm, Choosing the right data structure, Selecting the right tools **General programming tips for dealing with large data sets:** Don't reinvent the wheel, Get the most out of your hardware, Reduce your computing needs.	**CO1** **CO3**
V	**Plotting and Visualization: A Brief matplotlib API Primer**: Figures and Subplots, Colors, Markers, and Line Styles, Ticks, Labels, and Legends, Annotations and Drawing on a Subplot, Saving Plots to File, matplotlib Configuration **Plotting with pandas and sea born**: Line Plots, Bar Plots, Histograms and Density Plots, Scatter or Point Plots, Facet Grids and Categorical Data	**CO1** **CO4**

Learning Resources

Text Books

1. Introducing Data Science: Big data, machine learning, and more, using Python tools Davy Cielen, Arno D. B. Meysman, and Mohamed Ali, Manning Publishers
2. Python for Data Analysis: Data Wrangling with Pandas, NumPy, and IPython Wes McKinney, Second Edition,2018,O'Reilly Media, (Unit 4- (9^{th} Chapter)

References

1. Avrim Blum, John Hop croft and Ravindran Kannan. Foundations of Data Science.
2. Jure Leskovek, Anand Rajaraman and Jeffrey Ullman .Mining of MassiveDatasets.v2.1,CambridgeUniversityPress.2 014.(free online)
3. Jiawei Han, Micheline Kamber and Jian Pei. Data Mining: Concepts and Techniques, 3rd Edition. ISBN 0123814790.2011.

E- Resources and other Digital Material

https://www.coursera.org/browse/data-science/data-analysis
https://nptel.ac.in/courses/106106179

FUNDAMENTALS OF DATA SCIENCE
(Open Elective-III)

Course Code	20IT2701A	**Year**	IV	**Semester**	I
Course Category	OE-III	**Branch**	Offered by IT	**Course Type**	Theory
Credits	3	**L-T-P**	3-0-0	**Prerequisites**	Data Mining
Continuous Internal Evaluation :	30	**Semester End Evaluation:**	70	**Total Marks:**	100

Course Outcomes		**Blooms Taxonomy Level**
Upon Successful completion of course, the student will be able to		
CO1	**Understand** the basic concepts of Data Science	L2
CO2	**Apply** different modelling methods	L3
CO3	**Discuss** the concepts of web mining	L2
CO4	**Analyze** the different modelling methods	L4

Contribution of Course Outcomes towards achievement of Program Outcomes &Strength of correlations(3:Substantial,2: Moderate,1:Slight)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3												3	
CO2	3	3	3										3	
CO3	3		3										3	
CO4	3	3											3	

Syllabus		
Unit No	**Contents**	**Mapped CO**
I	**Introduction to data science:** The Data Science process: Roles in a data science project, stages of a data science project **Managing Data:** Cleaning data, Sampling for modeling and validation	CO1
II	**Modelling Methods:** Choosing evaluating models: Problems to machine learning tasks, Evaluating models	CO1 CO2 CO4
III	**Linear and Logistic Regression:** **Using Linear Regression:** Understanding Linear regression, building a linear regression model, Making Predictions **Using Logistic Regression:** Understanding Logistic Regression, building a Logistic regression model, Making Predictions	CO1 CO2 CO4
IV	**Unsupervised methods:** **Clustering Analysis:** Preparing Data, K-Means Algorithm **Association Rules:** Overview of Association rules, Mining Associations rules	CO1 CO2 CO4
V	**Web Mining** :Web Content mining, Web structure mining, Web usage mining, Text mining, Unstructured Text, Episode rule discovery for text, Text Clustering	CO1 CO3

Learning Resources
Text Books
1. Nina Zumel, John Mount: Practical Data Science with R , Dreamtech, 2015 2. Data Mining Techniques 3rd Edition Arun K Pujari 2013
References
Fundamentals of Data Science, 1st Edition By Sanjeev J. Wagh, Manisha S. Bhende, Anuradha D. Thakare, 2021
E- Resources and other Digital Material
http://nptel.ac.in

DISASTER MANAGEMENT AND PREPAREDNESS

(Open Elective-III)

Course Code	20CE2701A	**Year**	IV	**Semester**	I
Course Category	OE-III	**Branch**	Offered by CE	**Course Type**	Theory
Credits	3	**L-T-P**	3-0-0	**Prerequisites**	Environmental Science
Continuous Internal Evaluation :	30	**Semester End Evaluation:**	70	**Total Marks:**	100

Course Outcomes		**Blooms Taxonomy Level**
Upon Successful completion of course, the student will be able to		
CO1	**Demonstrate** basic terminology and **classify** types of disasters	L3
CO2	**Outline** the impacts of disaster	L2
CO3	**Familiarize** Disaster management activities and phases	L2
CO4	**Explain** the Components of disaster relief, disaster management policies	L3
CO5	**Develop** the responsibilities towards society after disaster	L3

Contribution of Course Outcomes towards achievement of Program Outcomes &Strength of correlations(3:Substantial,2: Moderate,1:Slight)

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	2	2					2			2				2
CO2	2	2					2			2				2
CO3	3	3					2			2				2
CO4	2	2					2			2				2
CO5	2	2					2			2				2

Syllabus		
Unit No	**Contents**	**Mapped CO**
I	**INTRODUCTION & DISASTERS CLASSIFICATION** Concepts and definitions: disaster, hazard, vulnerability, resilience, risks severity, frequency and details, capacity, impact, prevention, mitigation. Disasters classification; natural disasters (floods, draught, cyclones, volcanoes, earthquakes, tsunami, landslides, forest fires.); manmade disasters (industrial pollution, nuclear radiation, chemical spills, terrorist strikes); hazard and vulnerability profile of India.	**CO1**
II	**DISASTER IMPACTS** Disaster impacts (environmental, physical, social, ecological, economical, political); health, psycho-social issues; demographic aspects (gender, age, special needs); hazard locations; global and national disaster trends; climate change and urban disasters	**CO2**
III	**DISASTER MITIGATION AND PREPAREDNESS** Disaster management cycle – its phases; prevention, mitigation, preparedness, relief and recovery; structural and non-structural measures; risk analysis, vulnerability and capacity assessment; early warning systems, Role of remote sensing and GIS in disaster management.	**CO3**
IV	**POST DISASTER RESPONSE** Emergency medical and public health services; Environmental post disaster response (water, sanitation, food safety, disease control, security, communications);reconstruction and rehabilitation; Roles and responsibilities of government, community, local institutions, role of agencies like NDMA, SDMA and other International agencies, organizational structure, role of insurance sector.	**CO4**
V	**DISASTERS - ENVIRONMENT AND DEVELOPMENT** Factors affecting vulnerability such as impact of developmental projects and environmental modifications (including of dams, land use changes, urbanization etc.), sustainable and environmental friendly recovery; reconstruction and development methods.	**CO5**

Learning Resources
Text Books
1. R. B. Singh, Disaster Management, Rawat Publications, 2000 2. Pradeep Sahni, 2004, Disaster Risk Reduction in South Asia, Prentice Hall. 3. Singh B.K., 2008, Handbook of Disaster Management: Techniques & Guidelines, Rajat Publication.
References
1. Disaster Medical Systems Guidelines. Emergency Medical Services Authority, State of California, EMSA no.214, June 2003 2. Inter-Agency Standing Committee (IASC) (Feb. 2007). IASC Guidelines on Mental Health and Psychosocial Support in Emergency Settings. Geneva: IASC
E- Resources and other Digital Material
1. http://ndma.gov.in/ (Home page of National Disaster Management Authority) 2. http://www.ndmindia.nic.in/ (National Disaster management in India, Ministry of Home Affairs).

EMBEDDED AND REAL TIME SYSTE

Course Code	20EC2701A	**Year**	IV	**Semester**	I
Course Category	OE-III	**Branch**	Offered by ECE	**Course Type**	Theory
Credits	3	**L-T-P**	3-0-0	**Prerequisites**	Nil
Continuous Internal Evaluation:	30	**Semester End Evaluation:**	70	**Total Marks:**	100

Course Outcomes	
Upon successful completion of the course, the student will be able to	
CO1	**Apply** design methodologies for embedded systems. (L3)
CO2	**Build** embedded systems with specifications and technological choice. (L3)
CO3	**Develop** fundamental systems such as sensors, actuators, converters, processors, intra-and inter-communication networks and interfaces. (L3)
CO4	**Utilize** modern hardware/software tools for building prototypes of embedded systems. (L3)

Mapping of course outcomes with Program outcomes(CO/PO/PSO Matrix)
Note:1-Weak correlation 2-Medium correlation 3-Strong correlation
*-Average value indicates course correlation strength with mapped PO

CO/PO&PSO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO-1	2									2			2	2
CO-2	2									2			2	2
CO-3	3									3			3	3
CO-4	2									2			2	2
Average* (Rounded to nearest integer)	**2**	**2**								**2**			**2**	**2**

Syllabus		
Unit No.	**Contents**	**Mapped CO**
I	**Introduction:** History of Embedded Systems, Major Application Areas of Embedded Systems, Purpose of Embedded Systems, Core of the Embedded System, Sensors and Actuators, Communication Interface, Embedded Firmware.	CO1
II	**Hardware Software Co-Design And Programme Modeling:** Characteristics of an Embedded System, Quality Attributes of Embedded Systems, Fundamental Issues in Hardware Software Co-Design, Computational Models in Embedded Design, Hardware Software Trade-offs.	CO2
III	**Devices in Embedded Systems:** Types of supporting devices for an embedded system –various forms of ROM, RAM devices, interrupt sources, Interrupt Service Mechanism, serial port devices, parallel port devices, timers and counting devices.	CO3
IV	**Communication Buses for Device Networks:** Interfacing Features in Device Ports, Wireless Devices, Networked Embedded Systems, Serial Bus Communication Protocols, Parallel Bus Device Protocols- Parallel Communication Network Using ISA, PCI, PCI-X and Advanced Buses.	CO3
V	**Design of Real Time Systems:** processors in complex embedded systems, design process in embedded system, optimizing design metrics, Case study for adaptive cruise control system in car.	CO4

Learning Resources
Text books:
1. Embedded Systems Architecture, Programming and Design-Raj Kamal, Second Edition, Mc Graw Hill Education. 2. Introduction to Embedded System-ShibuKV, Mc-Graw Hill Edition.
References:
1. Peckol, "Embedded system Design", JohnWiley&Sons,2010 2. LylaBDas, "Embedded Systems"-An IntegratedApproach",Pearson,2013 3. Embedded/Real-Time Systems, Dr.K.V.K.K.Prasad, dream Tech press
e-Resources & other digital material
1. Micro soft Power Point-pcp_embedded_system_intro(iitb.ac.in) 2. NPTEL:: Electrical Engineering -Embedded Systems

e-WASTE MANAGEMENT

(Open Elective-III)

Course Code	20EC2701B	**Year**	IV	**Semester**	I
Course Category	OE3	**Branch**	ECE	**Course Type**	Theory
Credits	3	**L-T-P**	3-0-2	**Prerequisites**	
Continuous Internal Evaluation:	30	**Semester End Evaluation:**	70	**Total Marks:**	100

Course Outcomes	
Upon successful completion of the course, the student will be able to	
CO1	Know about the environmental impacts of e-waste.
CO2	Apply various concept learned under e-waste management hierarchy.
CO3	Distinguished the role of various national and internal act and laws applicable for e-waste management and handling.
CO4	Analyze the e – waste management measures proposed under national and global legislations.

Mapping of course outcomes with Program outcomes (CO/ PO/PSO Matrix)
Note: 1- Weak correlation 2-Medium correlation 3-Strong correlation
* - Average value indicates course correlation strength with mapped PO

COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1						2	2							
CO2						2	2							
CO3						2	2							
CO4						2	2							

Syllabus		
Unit No.	**Contents**	**Mapped CO**
I	**Introduction.** E- waste; composition and generation. Global context in e- waste; E-waste pollutants, E waste hazardous properties, Effects of pollutant (E-waste) on human health and surrounding environment, domestic e-waste disposal, Basic principles of E waste management, Component of E waste management, Technologies for recovery of resources from electronic waste, resource recovery potential of e-waste, steps in recycling and recovery of materials-mechanical processing, technologies for recovery of materials, occupational and environmental health perspectives of recycling e-waste in India.	CO1
II	**E-waste hazardous on Global trade** Essential factors in global waste trade economy, Waste trading as a quint essential part of electronic recycling, Free trade agreements as a means of waste trading. Import of hazardous e-waste in India; India's stand on liberalizing import rules, E-waste economy in the organized and unorganized sector. Estimation and recycling of e-waste in metro cities of India.	CO1, CO2
III	**E-waste control measures** Need for stringent health safeguards and environmental protection laws in India, Extended Producers Responsibility (EPR), Import of e-waste permissions, Producer-Public-Government cooperation, Administrative Controls & Engineering controls, monitoring of compliance of Rules, Effective regulatory mechanism strengthened by manpower and technical expertise, Reduction of waste at source.	CO1, CO3
IV	E-waste (Management and Handling) Rules, 2011; and E-Waste (Management) Rules, 2016 - Salient Features and its likely implication. Government assistance for TSDFs.	CO1, CO4
V	The international legislation: The Basel Convention; The Bamako Convention. The Rotterdam Convention. Waste Electrical and Electronic Equipment (WEEE) Directive in the European Union, Restrictions of Hazardous Substances (RoHS) Directive	CO1, CO4

Learning Resources
Text Books
1.E-waste: implications, regulations, and management in India and current global best practices",Johri R., TERI Press, New Delhi
Reference Books
1. Electronic Waste – 1st Edition (Toxicology and Public Health Issues), Fowler B. 2017Elsevier 2. Electronic Waste Management. Science ,Hester R.E., and Harrison R.M. 2009

NON-CONVENTIONAL ENERGY SOURCES

Course Code	20EE2701A	**Year**	IV	**Semester**	I
Course Category	OE – III	**Branch**	Offered by EEE	**Course Type**	Theory
Credits	3	**L-T-P**	3-0-0	**Prerequisites**	Nil
Continuous Internal Evaluation	30	**Semester End Evaluation**	70	**Total Marks**	100

Course Outcomes

Upon successful completion of the course, the student will be able to

CO1	**Understand** the process of energy collection, quantification, storage, conversion and applications of non-conventional sources. **(L2) 1 2 3 4 5**
CO2	**Apply** the knowledge of energy conversion by harvesting energy from different natural sources like light, heat, wind,water etc. **(L3) 1 2 3**
CO3	**Apply** basic laws of physics for the production of energy from Solar, wind, ocean, biomass, geothermal, fuel cell **(L3) 1 2 3 4 5**
CO4	**Analyze** the theory and designing wind mills, MHD, Fuel cells. **(L4) 3 5**
CO5	**Examine** the performance of solar and wind generating units and economic aspects of MHD biomass and Ocean energy sources. **(L4) 2 3 4 5**
CO6	**Ability** to apply the various energy generation techniques and to measure the **basic** parameters and **submit a report. 1 2 3 4 5**

Contribution of Course Outcomes towards achievement of Program Outcomes & Strength of correlations (3: High, 2: Medium, 1: Low)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1														
CO2	3						3						2	1
CO3	3						3						2	1
CO4		3											2	1
CO5		3					3						2	1
CO6									3	2		3	2	1

Unit No.	Syllabus	Mapped CO’s
1	**PRINCIPLES OF SOLAR RADIATION**: Role and potential of new and renewable source, the solar energy option, Environmental impact of solar power, physics of the sun, the solar constant, extra-terrestrial and terrestrial solar radiation, solar radiation on titled surface. Measurement of Solar Radiation: Pyrometer, shading ring pyrheliometer, sunshine recorder, schematic diagrams and principle of working.	CO1, CO2,CO3 CO6
2	**SOLAR ENERGY COLLECTION AND STORAGE:** Solar Light Energy: Photovoltaic effect, characteristics of photovoltaic cells, conversion efficiency, solar batteries and applications of photovoltaic energy conversion. Solar Heat Energy: Sensible, latent heat of Heat storage, solar ponds. Applications- solar heating/cooling technique, solar distillation and drying.	CO1, CO2 CO3, CO5, CO6
3	**WIND ENERGY**: Sources and potentials, horizontal and vertical axis windmills, performance characteristics, Betz criteria **OCEAN ENERGY:** OTEC, types of OTEC plants, mini-hydel power plants	CO1 – CO6
4	**BIO-MASS:** Principles of Bio-Conversion, Anaerobic/aerobic digestion,types of Bio-gas digesters. **GEOTHERMAL ENERGY:** Resources, methods of harnessing the energy.	CO1, CO3,CO5, CO6
5	**MHD Generators**: Basic principles of MHD generator and Hall Effect, different types of MHD generators. **Fuel Cells:** Introduction, principle of fuel cells, thermodynamic analysis offuel cells, types of fuel cells, fuel cell batteries, applications of fuel cells.	CO1, CO3, CO4,CO6

Learning Resources

Text Books :

1. G.D. Rai, Non-Conventional Energy Sources, Khanna publishers, 5th edition,2014.
2. S. Rao and B. B.Parulekar, Energy Technology- Non conventional, Renewable and Conventional, Khanna Pub ,3rd Edition, 1999.

Reference Books

1. Ashok V Desai, Non-Conventional Energy, New age publishers, 1st edition 1990.
2. B.H.Khan,Non-Conventional Energy Sources, Tata Mc Graw-hill Publishing Company, 2nd edition,2013.
3. B.T. Nijaguna, Biogas Technology, New Age International Pub, First edition 2002.
4. Tiwari and Ghosal, Renewable Energy resources, Narosa, 2nd edition 2005

Web links

https://www.coursera.org/learn/renewable-energy-technology-fundamentals
https://nptel.ac.in/courses/121106014

OPERATION RESEARCH

(Open Elective-3)

Course code	20ME2701A	Year	IV	Semester	I
Course category	OE-III	Offering Branch	ME	Course Type	Theory
Credits	3	L-T-P	3-0-0	Prerequisites	Nil
Continuous Internal Evaluation	30	Semester End Evaluation	70	Total Marks	100

Course Outcomes	Upon successful completion of the course, the student will be able to	BTL	Units
CO1	Understand the basics of linear programming, transportation, queueing, sequencing of jobs, replacement, inventory and simulation problems	L2	1,2,3,4,5
CO2	Apply linear programming, transportation and assignment models to solve real life problems	L3	1,2
CO3	Apply Sequencing, queueing, Game and Replacement theories to solve problems	L3	3,4
CO4	Apply knowledge of inventory control and simulation to solve practical industrial problems	L3	5

Contribution of Course outcomes towards achievement of Program outcomes &Strength of correlations (High:3, Medium: 2, Low:1)														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3								3	2			
CO2	3	3								3	2			
CO3	3	3								3	2			
CO4	3	3								3	2			

Syllabus		
UNIT	Contents	Mapped CO
I	**Introduction to Operations Research:** History, definition, operations research models, phases of implementing operations research in practice, applications. **Linear Programming**: Introduction, formulation, graphical solution, simplex method, artificial variable techniques – Big M and two-phase methods, duality principle.	CO1 CO2
II	**Transportation**: Formulation, initial feasible solution, optimal solution – MODI method, unbalanced transportation problems, degeneracy in transportation problems. **Assignment**: Formulation, optimal solution, Hungarian method, travelling salesman problem.	CO1 CO2
III	**Queuing theory**: Introduction, Kendall’s notation, classification of	CO1

	queuing models, single server and multi-server models, Poisson arrival, exponential service, infinite population **Sequencing**: Introduction, assumptions, processing n-jobs through two machines, n-jobs through three machines, and graphic solution for processing 2 jobs through n machines with different order of sequence.	**CO3**
IV	**Game Theory**: Introduction, game with pure strategies, game with mixed strategies, dominance principle, graphical method for 2xn and mx2 games. **Replacement Theory**: Introduction, replacement of items that deteriorate with time - value of money unchanging and changing, simple probabilistic model for replacement of items that fail completely	**CO1** **CO3**
V	**Inventory control**: Introduction, inventory costs, Economic Order Quantity (EOQ)Demand rate Uniform and replenishment rate infinite, demand rate non-uniform replenishment rate infinite, Demand rate uniform, models with and without shortages, inventory model with single price break. **Simulation**: Definition, Types of simulation models, phases of simulation, applications of simulation	**CO1** **CO4**

Learning Resource
Text books:
1. Operations Research, by S.D.Sharma, Kedarnath& Ramnath publications (15th edition),2013. 2. Introduction to Operations Research, by Taha, Pearson Education,New Delhi, (8th edition), 2008
Reference books
1. Operations Research, (4th edition) by A.M .Natarajan, P. Balasubramani, ATamilarasi, Pearson Education, New Delhi, 2009. 2. Operations Research, (2nd edition) by R.Pannerselvam, 2009,PHI Publications, Noida 3. Operations Research, (2nd edition) by Wagner, 2007, PHI Publications, Noida 4. Operation Research, (4th edition) by J.K.Sharma, 2009, MacMilan publishers, india Ltd. New Delhi.
E-Resources & other digital Material:
1. http://nptel.ac.in/courses/112106134/ 2. http://nptel.ac.in/courses/112106131/

MANAGEMENT INFORMATION SYSTEMS

Course Code	20ME2701B	Year	IV	Semester	I
Course Category	OE-III	Offering Branch	ME	Course Type	Theory
Credits	3	L-T-P	3-0-0	Prerequisites	Nil
Continuous Internal Evaluation	30	Semester End Evaluation	70	Total Marks	100

Course Outcomes	Upon successful completion of the course, the student will be able to	BTL	Units
CO1	Understand the basic concepts of MIS, Decision making, Applications of MIS, Decision support systems, BPR and E- Commerce.	L2	1,2,3,4,5
CO2	Interpret the MIS decision making and its applications.	L3	2,3
CO3	Categorize Decision support systems and Business Process Re-Engineering	L3	4
CO4	Summarize the Electronic commerce environment and its opportunities.	L3	5

Contribution of Course outcomes towards achievement of Program outcomes &Strength of correlations (High:3, Medium: 2, Low:1)														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	1			1			1	1	3	2	1		1
CO2	2	1			1			1	1	3	2	1		1
CO3	2	1			1			1	1	3	2	1		1
CO4	2	1			1			1	1	3	2	1		1

Syllabus		
UNIT	**Contents**	**Mapped CO**
I	**Introduction to MIS**: Definition of MIS, Role and Impact of MIS, MIS: Support to the management, As tool for Management Process, Basic model of organization, Modifications to the basic model, organization as a system, MIS: organization, Strategic management of business.	**CO1**
II	**Decision Making:** Concepts, Methods, Tools, Procedures, Organizational decision making, MIS and Decision making concepts, Information: A Quality Product, Classification of information, Value of information, General model of Human as information processor, Types of systems, Handling system complexity, Development of long range plans of the MIS, Development and implementation of MIS, Factors of Success and failure for MIS.	**CO1, CO2**
III	**Applications:** Applications in Manufacturing Sector, Personnel, financial, production, materials, marketing management, Applications in service sector, creating a Distinctive service, MIS in service industry, Technology of Information systems, Data processing, Transaction processing, Application processing, TQM of Information systems, Programming languages for system coding.	**CO1, CO2**
IV	**Decision support systems and BPR:** Concept and philosophy, Deterministic systems, Artificial Intelligence systems, Knowledge based expert system, Enterprise Management systems, ERP basic features EMS and MIS, Business Process Re- Engineering, Process model of organization, Value stream model of the organization MIS and BPR.	**CO1, CO3**
V	**E-Commerce:** Electronic commerce environment and opportunities: back ground, electronic commerce Environment, Modes of electronic commerce: Approaches to safe electronic commerce, Overview, Secure transport protocols, Secure Transactions, Secure Electronic Payment Protocol, and Secure Electronic Transaction.	**CO1, CO4**

Learning Resource

Text books:

1. W.S. Jawadekar, Management Information Systems: A Global Digital Enterprise Perspective, 5th Edition, McGraw Hill Education, 2013.
2. D. Minoli, Web Commerce Technology Hand Book, 1st edition, McGraw Hill Education, 2000.

Reference books

1. K.C. Laudon and J. Laudon, Management Information Systems: Managing a Digital firm, 11th Edition, Pearson Education, 2012.
2. D. Gordon and M. Oslon, Management Information Systems: Conceptual Foundations, Structure and Development, 2nd Edition, McGraw Hill Education Pvt Ltd, India, 2001.
3. R.G. Murdic, J.E. Ross and J.R. Clagget, Information Systems for Modern Management, 3rd Edition, PHI, 2008.
4. K.Ravi and A.B. Whinston, Frontiers of Electronic Commerce, 1st edition, Pearson India, 2002.

E-Resources & other digital Material:

1. http://nptel.ac.in/courses/112106134/
2. http://nptel.ac.in/courses/112106131/

FUNDAMENTALS OF ARTIFICIAL INTELLEGENCE

(Open Elective-IV)

Course Code	20IT2702A	**Year**	IV	**Semester**	I
Course Category	OE4	**Branch**	Offered by IT	**Course Type**	Theory
Credits	3	**L-T-P**	3-0-0	**Prerequisites**	-
Continuous Internal Evaluation:	30	**Semester End Evaluation:**	70	**Total Marks:**	100

Course Outcomes		**Blooms Taxonomy Level**
Upon Successful completion of course, the student will be able to		
CO1	Know the challenges and concepts of AI.	L2
CO2	Solve problems using heuristics search algorithms	L3
CO3	Transform knowledge into rules.	L3
CO4	Demonstrate Symbolic reasoning under uncertainty	L3
CO5	Acquainted with expert systems.	L3

Contribution of Course Outcomes towards achievement of Program Outcomes & Strength of correlations(3:Substantial,2:Moderate,1:Slight)

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	3												2	3
CO2		3											3	3
CO3		3											3	3
CO4		3					3						3	3
CO5				3									3	3

Syllabus		
Unit No	**Contents**	**Mapped CO**
I	**What is AI**: The AI Problems, What is an AI Techniques, Criteria for Successes? Problems and problem spaces and Search: Problem as a state space search, Production systems, Problem Characteristics, Production system characteristics.	**CO1**
II	**Heuristic search technique**: Generate and test, Hill climbing, Best First search, Problem reduction, Constraint satisfaction.	**CO1, CO2**
III	**Knowledge Representation issues**: Representations and mappings. **Representing knowledge using rules**: Procedural knowledge Vs Declarative knowledge, Forward Vs Backward reasoning, matching.	**CO3**
IV	**Symbolic reasoning under uncertainty**: Introduction to Non monotonic reasoning, Implementation in DFS and BFS. **Weak, strong slot and filler structures**: Semantic nets, Frames Conceptual dependency, Scripts.	**CO4**
V	**Planning**: Goal stack planning, Hierarchical planning **Expert Systems**: Expert system shells, Knowledge acquisition.	**CO5**

Learning Resources

Text Books

1. Artificial Intelligence, 2^{nd} Edition, E.Rich and K.Knight (TMH).

References

1. Artificial Intelligence and Expert Systems–Patterson PHI
2. ExpertSystemsPrinciplesandProgramming-FourthEdn,Giarrantana/Riley,Thomson
3. PROLOGProgrammingforArtificialIntelligence.IvanBratka-ThirdEdition–PearsonEducation.

e-Resources& other digital material

http://www.jntuk-coeerd.in/
http://nptel.ac.in/video.php?subjectId=106105079
http://nptel.iitk.ac.in/courses/Webcourse-contents/IIT%20Kharagpur/Artificial%20intelligence/New_index1.html

20CE2702A - ENVIRONMENTAL MANAGEMENT AND AUDIT

Course Category:	Open Elective -IV	Credits:	3
Course Type:	Theory	Lecture-Tutorial-Practical:	3-0-0
Prerequisites:	Environmental Science	Continuous Evaluation:	30
		Semester End Evaluation:	70
		Total Marks:	100

Course Outcomes

Upon successful completion of the course, the student will be able to:

CO1	**Illustrate** basic knowledge on solid waste management	L2
CO2	**Demonstrate** the handling of biomedical waste and its disposal	L3
CO3	**Distinguish** the E-waste sources, problems, control measures and E-waste rules	L3
CO4	**Outline** the basic principles of EIA.	L2
CO5	**Understand** the activities in environmental auditing.	L2

Contribution of Course Outcomes towards achievement of Program Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	2	2				2						2	2
CO2	2	2	2				2						2	2
CO3	3	3	3				2						3	2
CO4	2	2	2				2						2	2
CO5	2	2	2				2						2	2
Avg.	**2**	**2**	**2**				**2**						**2**	**2**

1- Low　　2-Medium　　3-High

Course Content

UNIT-1	**INTRODUCTION TO SOLID WASTE MANAGEMENT** Sources and types of municipal solid wastes-waste generation rates-factors affecting generation, characteristics, segregation of solid wastes – source reduction of waste – objectives of waste processing, elements of solid waste management – public role in solid waste management.	**CO1**
UNIT-2	**BIOMEDICAL WASTE MANAGEMENT** Definition-Sources-Classification of biomedical waste – Objectives of Biomedical waste management-segregation-containers for biomedical waste-Labelling Collection-Transport-Disposal methods	**CO2**
UNIT-3	**E-WASTE MANAGEMENT** E-waste: Sources- Types- components; Collection process- Segregation-Disposal methods; Effect on air, water and soil; Health hazards; Role of individual for E-waste management. Current E-waste Management Rules	**CO3**
UNIT-4	**ENVIRONMENTAL IMPACT ASSESSMENT (EIA)** Introduction-Definition-Scope-Objectives of EIA-Basic EIA Principles, Classification of EIA-Life Cycle Assessment-Environmental Policy of India. Baseline Data Acquisition: Environmental Inventory- Rapid EIA.	**CO4**
UNIT-5	**ENVIRONMENTAL AUDIT INTRODUCTION** Environmental audit Significance for Industry-Elements of Environmental audit. Process of environmental audit-Pre audit- Activity -Activities at site- Post audit.	**CO5**

Learning Resources	
Text Books	1. Agarwal, K.M., Sikdar, P.K., Deb., S.C (2005) A Text Book of Environment, Macmillan IndiaLimited. 2. Sharma, R.D. (1976), Organisational Management, Light and Life Publishers, New Delhi. 3. Varma and Agarwal, Theory & practice of Management Forward BookDepot, NewDelhi
Reference Books	1. Kovntz, H and C. Danvel (1978): Essential of management, second edition, Tata Mc Graw Hillpublishing company, New Delhi. 2. Erickson, P.A. (1977) Environmental Impact Assessment – Principles and Erickson,P.A. (1977)
E-Resources & other digital material	http://nptel.ac.in

TELECOMMUNICATIONS

(Open Elective-IV

Course Code	20EC2702A	**Year**	IV	**Semester**	I
Course Category	Open Elective-IV	**Branch**	ECE	**Course Type**	Theory
Credits	3	**L-T-P**	3-0-0	**Prerequisites**	--
Continuous Internal Evaluation:	30	**Semester End Evaluation:**	70	**Total Marks:**	100

Course Outcomes	
Upon successful completion of the course, the student will be able to	
CO1	Infer the basic knowledge of telecommunication system, regulations (L2).
CO2	Make use of revolutionary changes in Telecommunication technologies (L3).
CO3	Analyse different components of telecommunication system. (L4).
CO4	Appraise the use of various components of telecommunication systems (L4).

Mapping of course outcomes with Program outcomes (CO/ PO/PSO Matrix)

Note: 1- Weak correlation 2-Medium correlation 3-Strong correlation

* - Average value indicates course correlation strength with mapped PO

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO 11	PO12	PSO 1	PSO 2
CO1	2													
CO2	3									2				
CO3		2								2			2	2
CO4		2								2			2	2

Syllabus		
Unit No.	**Contents**	**Mapped CO**
I	**Telecommunication Systems:** Evolution of Tele Communication Systems, Simple telephone communication, Telephones, Telephone System, Facsimile, Internet Telephony, Tele Communication Standards.	CO1 –CO4
II	**Cell Phone Technologies**: Cellular Telephone Systems, A Cellular Industry Overview, 2G and 3G Digital Cell Phone Systems, Long Term Evolution and 4G Cellular Systems	CO1 –CO4
III	**Wireless Technologies:** Wireless LAN, PANs and Bluetooth, ZigBee and Mesh Wireless Networks,WiMAX and Wireless Metrop olitan-Area Networks- Infrared wireless- Ultra wideband wireless- Additional wireless applications	CO1 –CO4
IV	**Optical Communication:** Optical Principles, Optical Communication Systems, Fiber-Optic Cables, Optical Transmitters and Receivers.	CO1 –CO4
V	**Satellite Communication:** Satellite Orbits, Satellite Communication Systems, Satellite Subsystems, Ground Stations, Satellite Applications, Global Navigation Satellite Systems.	CO1 –CO4

Learning Resources
Text Books
1. Louis E. Frenzel Jr., Principles of Electronic Communication Systems, 4/e, Mc Graw Hill Publications, McGraw-Hill Education, 2016. 2. Telecommunication Switching Systems and Networks, by Thiagarajan Viswanathan, PHI
Reference Books
1.Telecommunication Switching and Networks. By P.Gnanasivam, New Age International 2. Willium C. Y. Lee, “Wireless & Cellular Telecommunications”, McGraw-Hill Companies Inc, Third Edition, 2006.1. 2. Wayne Tomasi, Advanced Electronic Communication Systems, 4/e, Pearson Education, 2013. 3. Dennis Roddy, Electronic Communications, 4/e, Pearson Education, 2003.

SATELLITE COMMUNICATIONS

Open Elective-IV

Course Code	20EC2702B	**Year**	IV	**Semester**	I
Course Category	OE-IV	**Offering Branch**	ECE	**Course Type**	Theory
Credits	3	**L-T-P**	3-0-0	**Prerequisites**	--
Continuous Internal Evaluation:	30	**Semester End Evaluation:**	70	**Total Marks:**	100

Course Outcomes	
Upon successful completion of the course, the student will be able to	
CO1	**Illustrate** the basic concepts of satellite communication and different Frequency allocations for satellite services. (L2)
CO2	**Analyze** the satellite orbits and link design for transmission & reception of signals (L4)
CO3	**Analyze** various satellite subsystems and its functionality. (L4)
CO4	**Choose** appropriate multiple access technique for a given satellite communication application (L3)

Contribution of Course Outcomes towards achievement of Program Outcomes & Strength of correlations (3:High, 2: Medium, 1:Low)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2									1				
CO2		3								2				
CO3		3								2				
CO4	2									2				

Syllabus		
Unit No.	**Contents**	**Mapped CO**
I	**Introduction:** Historical Back-ground, Basic Concepts of Satellite Communications, Frequency allocations for Satellite Services, Applications.	CO1
II	**Orbital Mechanics And Launchers:** Orbital Mechanics, Look Angle determination, Orbital perturbations, Orbit determination, launches and launch vehicles, Orbital effects in communication systems performance.	CO1, CO2
III	**Satellite Subsystems:** Attitude and orbit control system, telemetry, tracking, Command and monitoring, power systems, communication subsystems, Satellite antenna Equipment reliability and Space qualification.	CO1, CO3
IV	**Satellite Link Design:** Basic transmission theory, system noise temperature and G/T ratio, Design of down links, up link design, Design of satellite links for specified C/N, System design example.	CO1, CO2
V	**Multiple Access:** Frequency division multiple access (FDMA) Intermodulation, Calculation of C/N. Time division Multiple Access (TDMA) Frame structure, Examples. Satellite Switched TDMA On-board processing, DAMA, Code Division Multiple access (CDMA).	CO4

Learning Resources
Text Books
1. Satellite Communications – Timothy Pratt, Charles Bostian and Jeremy Allnutt, WSE, Wiley Publications, 2rd Edition, 2003 2. Satellite Communications Engineering – Wilbur L. Pritchard, Robert A Nelson and Henri G.SuyderhoudPearson Publications, 2nd Edition, 2003.
Reference Books
1. Satellite Communications : Design Principles - M. Richharia, BS Publications, 2rd Edition, 2003 2. Satellite Communication - D.C Agarwal, Khanna Publications, Mc.Graw Hill, 5th Edition, 2008. 3. Fundamentals of Satellite Communications – K.N. Raja Rao, PHI, 2004. 4. Satellite Communications – Dennis Roddy, McGraw Hill, 2nd Edition, 1996
e- Resources & other digital material
1. https://nptel.ac.in/courses/117/105/117105131/3.https://nptel.ac.in/courses/108/105/108105159/

UTILIZATION OF ELECTRICAL POWER

Open Elective-IV

Course Code	20EE2702A	**Year**	IV	**Semester**	I
Course Category	OE-IV	**Branch**	Offered by EEE	**Course Type**	Theory
Credits	3	**L-T-P**	3-0-0	**Prerequisites**	--
Continuous Internal Evaluation :	30	**Semester End Evaluation:**	70	**Total Marks:**	100

Course Outcomes	
Upon successful completion of the course, the student will be able to	
CO1	**Understand** the utilization of electrical systems and their advantages in industrial applications. (L2)
CO2	**Apply** the knowledge to select suitable motor for electric drives, appropriate heating / welding techniques and Illumination systems in various industrial applications. (L3)
CO3	**Apply** the knowledge to select suitable track electrification system and traction motors. (L3)
CO4	**Analyze** the concepts of electric drives, different heating/welding techniques and various Illumination systems for industrial applications. (L4)
CO5	**Analyze** the performance parameters of speed-time curves for different services and the mathematical concepts to design traction system. (L4)
CO6	**Submit a report** on electric drives, electric heating & welding, illumination and electric traction system.

Contribution of Course Outcomes towards achievement of Program Outcomes & Strength of correlations (3:High, 2: Medium, 1:Low)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1														
CO2	3					1								
CO3	3						1							
CO4		3				1								
CO5		3					1							
CO6		3				3			3	3				

SYLLABUS		
Unit No.	**Contents**	**Mapped CO**
I	**Electric Drives** Type of electric drive, choice of motor, starting and running characteristics, speed control, temperature rise of electrical machines, heating-time and cooling-time curves, selecting motor power rating for continuous, intermittent and short timeduty, types of industrial loads, applications of electric drives.	**CO1** **CO2** **CO4** **CO6**
II	**Electric Heating & Electric Welding** Advantages and methods of electric heating, methods of heat transfer, Stefan's law, design of heating elements, resistance heating, construction and working principle of induction furnaces, arc furnaces and dielectric heating. Types of welding, resistance and arc welding, comparison between A.C and D.CWelding.	**CO1** **CO2** **CO4** **CO6**
III	**Illumination** Introduction, Terms used in illumination, laws of illumination, sources of light, Incandescent lamps, Discharge lamps, MV and SV lamps, fluorescent lamps-CFL-LED lamps, Types of lighting schemes, factory lighting, flood lighting and street lighting.	**CO1** **CO2** **CO4** **CO6**
IV	**Electric Traction-I** Systems of electric traction and systems of track electrification, special features of traction motors, methods of electric braking-plugging, rheostat braking and regenerative braking, Speed-time curves for different services-trapezoidal and quadrilateral speed time curves.	**CO1** **CO3** **CO5** **CO6**
V	**Electric Traction-II** Mechanics of train movement, Calculations of tractive efforts and power output of traction motor, Specific energy consumption for given run, effect of varying acceleration and braking retardation, dead weight, accelerating weight, adhesive weight and coefficient of adhesion, Current collectors for overhead system.	**CO1** **CO3** **CO5** **CO6**

Learning Resources
Text Books:
1. H. Partab, "Art & Science of Utilization of Electrical Energy", Dhanpat Rai & Sons, 12th edition, 2012. 2. E. Openshaw Taylor, "Utilization of Electrical Energy", Orient Longman, 15th edition, 2012.
Reference Books:
1. J.B.Gupta, "Utilization of Electric Power and Electric Traction", S.K.Kataria & Sons, 10th edition, 2012. 2. C.L.Wadhwa, "Generation, Distribution and Utilization of Electrical Energy", New Age international (P) Limited Publishers, 2015.
e- Resources
https://nptel.ac.in/courses/108105060

MECHATRONICS

Open Elective-IV

	Statement	BTL	Units

Course Code	20ME2702A	Year	IV	Semester	I
Course Category	Open Elective-4	Offering Branch	ME	Course Type	Theory
Credits	3	L – T – P	3 – 0 – 0	Prerequisites	Basic electrical and electronics
Continuous Internal Evaluation	30	Semester End Evaluation	70	Total Marks	100

CO1	Explain the concepts related to elements of Mechatronic systems.	L2	1,2,3,4,5
CO2	Summarize the construction and working of sensors used in building mechatronic systems.	L3	1
CO3	Illustrate various types of actuation systems and their components.	L3	2
CO4	Develop mathematical models using building blocks and make use of these models to find the dynamic response.	L3	3
CO5	Summarize the construction and working of closed loop controllers, Micro processor and Microcontrollers.	L3	4
CO6	Illustrate the features and applications of digital logic, PLC and of Fuzzy logic.	L3	5

Contribution of Course outcomes towards achievement of Program outcomes &Strength of correlations (High:3, Medium: 2, Low:1)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3									2		2		
CO2	3									2		2		
CO3	3		3							2		2		
CO4	3	3			2					2		2		
CO5	3				2					2		2		
CO6	3				2					2		2		

Syllabus		
UNIT	**Contents**	**Mapped CO**
I	**INTRODUCTION:** Definition of Mechatronics, evolution of mechatronics, systems, measurement systems, control systems, mechatronic design process, traditional design and mechatronic design, applications of mechatronic systems, advantages and disadvantages of mechatronic systems. **SENSORS:** classification of sensors, basic working principles, Velocity sensors – Proximity and Range sensors, ultrasonic sensor, laser interferometer transducer, Hall Effect sensor, inductive proximity switch. Light sensors – Photodiodes, phototransistors, tactile sensors –PVDF tactile sensor, micro-switch and reed switch, Piezoelectric sensors, vision sensor	**CO1** **CO2**

II	**PNEUMATICAND HYDRAULIC ACTUATION SYSTEMS:** Actuation systems, Pneumatic and Hydraulic systems- constructional details of filter, lubricator, regulator,	**CO1** **CO3**

	direction control valves, pressure control valves, flow control valves, actuators-linear and rotary. **ELECTRICAL ACTUATION SYSTEMS**: Electrical systems, Mechanical switches, solid state switches, solenoids, DC motors, AC motors, stepper motors. Characteristics of pneumatic, hydraulic, electrical actuators and their limitations.	
III	**BASIC SYSTEM MODELS:** Mathematical models, mechanical system building blocks, electric system building blocks, fluid system building blocks, thermal system building blocks. **DYNAMIC RESPONSES OF SYSTEMS:** Transfer function, Modelling dynamic systems, first order and second order systems.	**CO1 CO4**
IV	**CLOSED LOOP CONTROLLERS:** Classification of control systems, feedback, closed loop and open loop systems, continuous and discrete processes, control modes, two step mode, proportional mode, derivative control, integral control, PID controller. **MICROPROCESSOR AND MICRO CONTROLLER:** Introduction, Architecture of a microprocessor (8085), Architecture of a Micro controller, Difference between microprocessor and a microcontroller.	**CO1 CO5**
V	**DIGITAL LOGIC:** Digital logic, number systems, logic gates, Boolean algebra, Karnaugh maps, application of logic gates, sequential logic, transducer Signal Conditioning and devices for data conversion. **PROGRAMMABLE LOGIC CONTROLLERS :**Introduction, basic structure, input/output processing, programming, mnemonics, timers, internal relays and counters, shiftregister,masterandjumpcontrols.Datahandling,Analoginput/output,selectionofaPLC. **FUZZY LOGIC APPLICATIONS IN MECHATRONICS**: Fuzzy logic systems, Fuzzy control, Uses of Fuzzy expert systems.	**CO1 CO6**

Learning Resource

Text books:

1. Mechatronics Electronic Control Systems in Mechanical and Electrical Engineering, (3rdedition), by WBolton, Pearson Education Press, 2005.
2. Mechatronics System Design, 5thIndian reprint, 2009, by Devdas shetty, Richard A.kolk, PWS Publishing Company

Reference books

1. Mechatronics Sou rce Book, by Newton C Braga, Thomson Publications, Chennai.
2. Mechatronics, by N. Shanmugam, Anuradha Agencies Publishers.
3. Control sensors and actuators, by C. W. Desilva, Prentice Hall.
4. Design with Micro processors for Mechanical Engineers, by Stiffler, A. K. McGraw-Hill(1992).

E-Resources & other digital Material:

1. https://onlinecourses.nptel.ac.in/noc22_me54/course

ROBOTICS
Open Elective-IV

Course code	20ME2702B	Year	IV	Semester	I
Course category	Open Elective-4	Offering Branch	ME	Course Type	Theory
Credits	3	L-T-P	3-0-0	Prerequisites	Nil
Continuous Internal Evaluation	30	Semester End Evaluation	70	Total Marks	100

Course Outcomes: Upon successful completion of the course, the student will be able to				
	Statement	**Skill**	**Level**	**Units**
CO1	Understand the basic anatomy of robots, actuators, end effectors, robot sensors, programming and applications.	Understand	L2	1,2,3,4,5
CO2	Understand the working principles of robot actuators, end effectors	Understand	L2	2
CO3	Apply robot programming skills	Apply, Modern Tool Usage	L3	3
CO4	Apply knowledge of robot sensors and their applications in industries	Apply	L3	4,5

Contribution of Course Outcomes towards achievement of Program Outcomes & Strength of correlations (3:High, 2: Medium, 1:Low)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3													
CO2	3	3												
CO3	3	3	2		2									
CO4	3		2											

Syllabus		
UNIT	**Contents**	**Mapped COs**
I	**Introduction:** Automation and robotics – History of robots -Robot anatomy – classification of robots, major components-robot specifications, selection of robots.	**CO1**
II	**Robot actuators-** Pneumatic, Hydraulic actuators, electric & stepper motors **End Effectors-** types of end effectors, grippers and tools, Requirements and challenges of end effectors.	**CO1, CO2**
III	**Robot Programming: -** Robot programming languages - programming methods - off and on-line programming - Lead through method - Teach pendent method, simple programs.	**CO1, CO3**
IV	**Sensors used in robots:** Sensor devices, Types of sensors - contact, position and displacement sensors, Force and torque sensors - Proximity and range sensors - acoustic sensors –slip sensors, Robot vision systems	**CO1, CO4**

V	**Applications of robots:** Application of robots in industry **-** material handling, processing operations, assembly, and inspection operations.	**CO1, CO4**

Learning Resource
Text books:
1. Mikell P. Groover. Industrial Robotics Technology Programming and Applications, McGraw Hill Co., Singapore, 1995. 2. Robotic Engineering by Richard D.Klafter, Prentice Hall
Reference books
1. Introduction to Robotics – Saeed B.Niku, Prentice Hall 2. Introduction to Robotics – John J. Craig, Addison Wesley
E-Resources & other digital Material:
1. http://nptel.ac.in/downloads/112101098/

DATABASE MANAGEMENT SYSTEMS

Open Elective-IV

Course Code	20CS2702A	**Year**	IV	**Semester**	I
Course Category:	OE-IV	**Offering Branch**	**CSE**	**Course Type**	Theory
Credits:	3	**L – T – P**	3-0-0	**Prerequisites:**	Nil
Continuous Evaluation:	30	**Semester End Evaluation:**	70	**Total Marks:**	100

Course Outcomes		
Upon successful completion of the course, the student will be able to:		
CO1	Understand the basic concepts of database management systems	**L2**
CO2	Apply SQL commands to find solutions for a given application	**L3**
CO3	Apply ER Modeling to design a database application	**L3**
CO4	Apply normalization techniques to improve database design.	**L3**

Contribution of Course Outcomes towards achievement of Program Outcomes & Strength of correlations (3:Substantial, 2: Moderate, 1:Slight)

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	2													
CO2	3								2	2			3	
CO3	3								2	2			3	
CO4		2							2	2			3	3

Unit No.	CONTENTS	Mapped CO
I	**Introduction to Databases:** Characteristics of the Database Approach, Advantages of using the DBMS Approach, A Brief History of Database Applications. **Overview of Database Languages and Architectures:** Data Models, Schemas and Instances, Three-Schema Architecture and Data Independence, Database Languages and Interfaces, Database System environment, Centralized and Client-Server Architecture for DBMS.	**CO1**
II	**Relational Model:** The Relational Model Concepts, Relational Model Constraints and Relational Database Schemas. **SQL:** Data Definition, Constraints, Basic Queries and Updates, Views (Virtual Tables) in SQL	**CO2**
III	**Conceptual Data Modeling:** High-Level Conceptual Data Models for Database Design, A Sample Database Application, Entity Types, Entity Sets, Attributes and Keys, Relationship Types, Relationship Sets, Roles, and Structural Constraints, Weak Entity Types. **ER-Diagrams:** Refining the ER Design, ER Diagrams, Naming Conventions and Design Issues	**CO3**
IV	**Database Design Theory**: Functional Dependencies, Normal forms based on Primary Keys, Second and Third Normal Forms, Boyce-Codd Normal Form.	**CO4**
V	**Transaction Processing**: Introduction, Transaction and System Concepts, Desirable Properties of Transactions. **Introduction to Protocols for Concurrency Controlling Databases:** Two-Phase Locking Techniques for Concurrency Control- Types of Locks and System Lock Tables.	**CO1**

Learning Resources
Textbooks
1.Database Systems Models, Languages, Design and Application Programming, Ramez Elmasri, Shamkant B.Navathe,6th Edition, Pearson.
References
1. Database Management Systems, Raghurama Krishnan,JohannesGehrke,3rdEdition,TMH. 2. Database System Concepts, Abraham Silberschatz, Henry FKorth,S.Sudarshan,5th Edition,McGrawHill.
e-Resources and other Digital Material
1.https://nptel.ac.in/courses/106/105/106105175/ 2.https://onlinecourses.nptel.ac.in/noc21_cs04/ 3.https://nptel.ac.in/courses/106/106/106106093/

MANAGERIAL ECONOMICS AND FINANCIAL ANALYSIS

Course Code	20HS7701A	Year	IV	Semester	I
Course Category	HSS	Offering Branch	ME	Course Type	Theory
Credits	3	L-T-P	3-0-0	Prerequisites	Nil
Continuous Internal Evaluation	30	Semester End Evaluation	70	Total Marks	100

Course Outcomes: Upon successful completion of the course, the student will be able to				
	Statement	**Skill**	**BTL**	**Units**
CO1	Understand basics of managerial economics, demand forecasting, cost analysis, industrial organization, financial accounting and capital and capital budgeting.	Understand	L2	1,2,3,4,5
CO2	Apply the managerial economics, e-commerce, demand forecasting and cost analysis techniques in economics related problems.	Apply	L3	1,2
CO3	Summarize different types of industrial organization	Apply	L3	3
CO4	Analyze the financial accounting and depreciation related problems.	Analyze	L4	4,5

Contribution of Course outcomes towards achievement of Program outcomes &Strength of correlations (High:3, Medium: 2, Low:1)														
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	3					2		2			3			
CO2	3					2		2			3			
CO3	3					2		2			3			
CO4	3					2		2			3			

Syllabus		
UNIT	**Contents**	**Mapped CO**
I	**Introduction To Managerial Economics**: Introduction, characteristics, scope & definition of Managerial Economics, its relation with other subjects, Basic economic tools in Managerial Economics. Demand Analysis: Meaning- Demand distinctions- Demand determinants- Law of Demand and its exceptions. **Elasticity Of Demand & Demand Forecasting**: Definition -Types of Elasticity of demand - Measurement of price elasticity of demand and it's significance: Total outlay method, Point method and Arc method. Demand Forecasting: Meaning - Factors governing demand forecasting - Methods of demand forecasting.	**CO1 CO2**
II	**Theory Of Production And Cost Analysis- Introduction To Markets-Pricing Policies & E-Commerce**: Production Function- Isoquants and Isocosts, Law of variable proportions- Law of returns to scale- Least Cost Combination of Inputs, Cobb-Douglas Production function-Economies of Scale **Cost Analysis**: Cost concepts, Determination of Break Even Point (BEP) with simple problems, Managerial Significance and limitations of BEP. Market structures: Types of competition, Features of Perfect	**CO1 CO2**

	Competition, Monopoly and Monopolistic Competition. Pricing strategies.	
III	**Types Of Industrial Organization & Introduction To Business Cycles**: Characteristic features of Industrial organization, Features and evaluation of Sole Proprietorship, Partnership, Joint Stock Company, State/Public Enterprises and their types. Changing business environment in post-liberalization scenario.	**CO1** **CO3**
IV	**Financial Management And Introduction To Financial Accounting**: Functions of financial management, simple and compound interest, Methods of evaluating alternatives- Present Worth method. Future worth Method, Annual equivalent method. Introduction to Double-entry system	**CO1** **CO4**
V	**Depreciation**: Introduction, common methods of depreciation: straight line method, Declining balance method, sum of year's digits method. **Capital And Capital Budgeting:** Meaning of capital budgeting, Need for capital budgeting – Capital budgeting decisions (Examples of capital budgeting) - Methods of Capital Budgeting: Payback Method, Accounting Rate of Return (ARR), IRR and Net Present Value Method (simple problems).	**CO1** **CO4**

Learning Resources

Text Books:

1. Engineering economics, R. Panneerselvam,2nd Edition, PHI Learning Pvt. Ltd., 2013 .
2. Managerial Economics and Financial Analysis, by J.V.Prabhakar Rao, Maruthi Publications, 2011.

Reference Books:

1. Managerial Economics and Financial Analysis, by A R Aryasri, TMH 2011.
2. Financial Accounting, SNMaheswari, SKMaheswari, Vikas Publishing House Pvt Ltd., NewDelhi, 4th Edition,2006.
3. Managerial Economics by Suma damodaran, Oxford 2011.
4. Mangerial Economice and Financial Analysis by S.A. Siddiqui & A.S. Siddiqui, New Age International Publishers, 2011.
5. Engineering economy- Theusen&Theusen, 8th edition,1993,Prentice Hall.

E-Resources & other digital Material:

1. www.tectime.com
2. www.exinfm.com
3. www.economywatch.com

HUMAN RESOURCES MANAGEMENT

Course Code	20HS7701B	**Year**	IV	**Semester**	I
Course Category	HSS	**Branch**	IT	**Course Type**	Theory
Credits	3	**L-T-P**	3-0-0	**Prerequisites**	-
Continuous Internal Evaluation:	30	**Semester End Evaluation:**	70	**Total Marks:**	100

Course Outcomes		**Level**	**Unit No**
Upon successful completion of the course, the student will be able to			
CO1	Understand the basic concepts, techniques and applications of Human Resource Management	L2	1,2,3, 4,5
CO2	Describe job design, job Analysis, job evaluation and different levels of recruitment	L2	2,3
CO3	Illustrate different Training and development of human resources	L3	4
CO4	Summarize e-Human Resource Management and Human resource for small scale industries	L3	5

Contribution of Course Outcomes towards achievement of Program Outcomes & Strength of correlations (H:High(3), M: Medium(2), L:Low(1))

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1		2			3					3	1	1	3
CO2	1		2			3					3	1	1	3
CO3	1		2			3					3	1	1	3
CO4	1		2			3					3	1	1	3

Syllabus		
UNIT	**Content**	**Mapped CO**
I	**Introduction:** Functions, Policies & Roles, Skills for HR Professionals, HRM Models, Evolution of HRM, Recent developments in HRM, Nature of Strategic HRM, Strategic HRM versus Conventional HRM, Strategic Management Process, Benefits of SHRM, Barriers to Strategic HRM, Typical HR Strategies, Selecting Strategies to Enhance Performance. **Human Resource Planning:** Nature of HRP, Importance of HRP, Factors Affecting HRP, The Planning Process, Human Resource Planning and the Government Requisites for Successful HRP, Barriers to HRP	**CO1**
II	**Analysis of Work, Designing Jobs and Job Evaluation:** Nature of Job analysis, Job Analysis and Competitive Advantage, The Process of Job Analysis, Methods of Collecting Job Data, Job Analysis and Strategic HRM, Potential Problems with Job Analysis. Requisites for Job Analysis, Competency-based Job Analysis, Job Design, Significance of Jobs Design, Factors Affecting Job Design, Job Design Approaches, Contemporary Issues in Job Design, Job Evaluation, Job Evaluation Process, Methods of Job Evaluation, Alternative to Job Evaluation	**CO1,CO2**
III	**Recruiting Talent:** Nature of Recruitment, Purposes and Importance, Factors Governing Recruitment, Recruitment Process, Evaluation and Control, Philosophies of Recruiting, Alternatives to Recruitment **Selecting Right Talent:** Nature of Selection, Selection as a Source of Competitive Advantage, Organisation for Selection, Selection Process, Assessment Centres, Barriers to Effective Selection, Evaluation of Selection Process, Making Selection Effective.	**CO1,CO3**
IV	**Training and Development, Career Management and Talent Management** Orientation, Orientation Programme, Requisites of an Effective Programme, Evaluation of Orientation Programme, Problems of Orientation, Typical Orientation Programme, Nature of Training and Development, Inputs in Training and Development, Training and Development as Source of Competitive Advantage, The Training Process, Impediments to Effective Training Government Initiative, Management Development, Career Development, Talent Management.	**CO1,CO3**
V	**e-Human Resource Management:** Nature of e-HRM, e-HR Activities, e-Recruitment, e-Selection, e-Performance Management, e-Learning, e-Compensation **Human Resource Management in Small Scale Units:** Introduction to Small Business Unit, Significance of MSM Enterprises, Facilities Problems, People Practices in Small Units, Challenges in Introducing HR Practices, Current Practices, Guidelines for Application of HR Practices.	**CO1,CO4**

Learning Resources

Text Books

1. Human Resource Management, Text & Cases by K. Aswathappa

Reference Books

1. Human Resource Management, by S. Khandkar, S. Chand Publications
2. Personnel Management - Text & Cases, By C. B. Mamoria& V. S. P. Rao, Himalaya
3. Human Resource Management by Gary Dessler, Pearson Education

E-Resources & other digital Material

1. https://onlinecourses.swayam2.ac.in/cec20_mg19/preview
2. https://onlinecourses.swayam2.ac.in/ntr22_ed08/preview

ENTREPRENEURSHIP MANAGEMENT

Course Code	**20HS7701C**	**Year**	IV	**Semester**	I
Course Category	Humanities and Social Science Electives	**Offering Branch**	ME	**Course Type**	Theory
Credits	3	**L-T-P**	3-0-0	**Prerequisites**	Nil
Continuous Internal Evaluation	30	**Semester End Evaluation**	70	**Total Marks**	100

Course Outcomes: Upon successful completion of the course, the student will be able to				
	Statement	**Skill**	**BTL**	**Units**
CO1	Understand the basic concepts and factors for starting and successful running of different forms of an enterprise.	Understand	L2	1,2,3,4,5
CO2	Describe characteristics, values and attitudes of an entrepreneur.	Understand	L2	2
CO3	Illustrate different forms of Entrepreneurial structures and Intrapreneurship.	Application	L3	3,4
CO4	Summarize critical Factors for starting a new enterprise and ethics to be followed during running of enterprise.	Application	L3	5

Contribution of Course outcomes towards achievement of Program outcomes &Strength of correlations (High:3, Medium: 2, Low:1)														
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	1		2			3			3		3	2		
CO2	1		2			3			3		3	2		
CO3	1		2			3			3		3	2		
CO4	1		2			3		3	3		3	2		

Syllabus		
UNIT	**Content**	**Mapped CO**
I	**Introduction to Entrepreneurship**: Meaning, Nature, origin and development of entrepreneurship in India, Need and Importance, Core elements, Principles, Essentials, Types, Functions, Concept of entrepreneurship management, Motives behind being an entrepreneur, Entrepreneurial Process.	**CO1**

II	**Entrepreneurial Values and Attitudes**: Introduction to entrepreneurial Values and Attitudes, Dominant characteristics of successful entrepreneurs, Internal and external factors for entrepreneurial motivation, Entrepreneurial Skills, Identifying business opportunities. **Role of creativity in Entrepreneurship-** the creative process, the Innovation process, types of innovation, sources of innovation, principles of innovation, Sources of Business Ideas.	**CO1, CO2**
III	**Forms of Entrepreneurial structures**: Sole Proprietorship-meaning, merits and limitations, Partnership-Meaning, Forms, merits and limitations. **Corporations**-Meaning, merits and limitations, Limited Liability partnerships and corporations, Franchising-Meaning, types, merits and limitations.	**CO1, CO3**
IV	**Intrapreneurship**: Meaning, Characteristics, Intrapreneurs Activities, types of Corporate Entrepreneurs, Corporate V/s Intrapreneurial culture, Climate, Fostering Intrapreneurial culture. **Promoting intrapreneurship**- Pinchot's Spontaneous teams and Formal Venture teams, establishing intrapreneurial ventures.	**CO1, CO3**
V	**Critical Factors for starting a new enterprise**: Personal, Environmental, Sociological factors, Problems of a new venture- Financial, administrative, marketing, production and other problems **Ethics and Entrepreneurship**: Defining Ethics, Approaches to Managerial ethics, ethics and business decisions, Ethical practices and code of conduct, Ethical considerations in corporate entrepreneurship.	**CO1, CO4**

Learning Resources
Text Books
1. Entrepreneurship development, Moharanas and Dash C.R., RBSA Publishing, Jaipure. 2. Beyond entrepreneurship, Collins and Lazier W, Prentice Hall, New Jersey, 1992. 3. Entrepreneurship, Hisrich Peters Sphephard, Tata McGraw Hill. 4. Fundamentals of entrepreneurship, S.K. Mohanty, Prentice Hall of India.
Reference Books
1. Small scale industries and entrepreneurship, Dr. Vasant Desai, Himalayan Publishing House. 2. Management of small scale industries, Dr. Vasant Desai, Himalayan Publishing House. 3. Management of small scale industries, J.C. Saboo Megha Biyani, Himalayan Publishing House. 4. A Guide to Entrepreneurship, David Oates, Jaico Publishing House, Mumbai, Edn 2009.
E-Resources & other digital Material
1. https://onlinecourses.swayam2.ac.in/cec20_mg19/preview 2. https://onlinecourses.swayam2.ac.in/ntr22_ed08/preview

20HS7701E - CONSTRUCTION MANAGEMENT

Course Category:	Humanities and Social Sciences Elective	Credits:	3
Course Type:	Theory	Lecture-Tutorial-Practical:	3-0-0
Prerequisites:	Construction materials and Concrete Technology	Continuous Evaluation:	30
		Semester End Evaluation:	70
		Total Marks:	100

Course Outcomes

Upon successful completion of the course, the student will be able to:

CO1	**Knowledge** on different methods of planning, scheduling and controlling and Work break down structure	L2
CO2	A complete i**dea** on developing time estimates and problems on network analysis.	L2
CO3	**Understanding** of cost analysis and resource allocation and scheduling	L2
CO4	An **idea** on construction management, safety and roles of different stake holders	L2
CO5	**Knowledge** on types of organization and related policies and acts	L2

Contribution of Course Outcomes towards achievement of Program Outcomes

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1		2	2			2		3	2		2	1	1	2
CO2		2	2			2		3	2		2	1	2	1
CO3		2	2			2		3	2		2	1	2	1
CO4		2	2			2		1	1		1	1	2	2
CO5		2	2			2		1	2		2	1	2	2
Avg.		2	2			2		3	2		2	1	1	2

1- Low **2-Medium** **3-High**

Course Content

UNIT-1	**Introduction to Construction Management :** Introduction : Origin of PERT and CPM, Planning, Scheduling and controlling, Bar Charts, Milestone charts, weaknesses in Bar charts, PERT and CPM networks and Problems, Comparison, Event, Activity, Rules for drawing networks Numbering the events (Fulkerson's law), Dummy activities, Work Break-down structure.	**CO1**
UNIT-2	**CPM-PERT-Network Analysis:** Time estimate-Expected time, Earliest allowable occurrence time, Latest allowable occurrence time, slack and Problems, Problems on Network Analysis, project duration, probability of completion, Start and Finish time estimates, Floats and Problems, Project scheduling, Critical and sub-critical path. Updating – Process of updating; when to update	**CO2**
UNIT-3	**CPM Cost Model & Resources allocations, resource scheduling:** Cost Analysis; direct and indirect costs, operation time, Normal and crash times and costs, Problems on cost analysis, Optimizing project cost, crash limit, Free float limit, Optimization Resource smoothening. Resource levelling.	**CO3**

UNIT-4	**Management:** Scope of Construction Management; Significance of Construction Management, Concept of Scientific Management; Safety in Construction, Qualities of Manager; The roles/functions performed by effective and competent Managers, The Manager: i) as a decision maker; ii) as a motivator; iii) as a communication-link; iv) as a conflict resolver; v) as a well – wisher of co-employees and the employer; etc Role play with roles of different stakeholders of construction industry.	**CO4**
UNIT-5	**Organization –** Types of organization; Merits and demerits of different types of organization – Authority –Policy– Labour Problems; Labour Legislation in India; 'Workmen's compensation Act of 1923 and Minimum Wages Act of 1948', and subsequent amendments.	**CO5**

Learning Resources

Text Books	1. Dr. B. C. Punmia and K. K. Khandelwal, Project Planning and Control with PERT and CPM, 4/e, Laxmi Publications, 2016 2. Kumar Neeraj Jha, Construction Project Management: Theory and Practices, 2/e, Pearson Education, 2015
Reference Books	1. Dr. P. N. Modi, Rajeev Modi, PERT and CPM - Project Evaluation Review Technique and Critical Path Method, 5/e, Standard Book House, 2012. 2. L S Srinath, PERT and CPM Principles and Applications, 3/e, Affiliated East-West Press, 2001. 3. U.K. Shrivastava, Construction Planning and Management, 2/e, Galgotia Publications- New Delhi, 2000. 4. Kerzner H., Project Management- A systems approach to planning, scheduling and controlling, 10/e, John Wiley & Sons, Inc., New Jersey, USA, 2009.
e-Resources& other digital material	1. https://nptel.ac.in/courses/105104161/ 2. http://jntuk-coeerd.in/

20HS7701D - ORGANIZATIONAL BEHAVIOR

Course Category:	Humanities and Social Sciences Elective	**Credits:**	3
Course Type:	Theory	**Lecture-Tutorial- Practical:**	3-0-0
Prerequisites:	Nil	**Continuous Evaluation:**	30
		Semester End Evaluation:	70
		Total Marks:	100

Course Outcomes	Upon successful completion of the course, the student will be able to:	
	CO 1	Demonstrate the applicability of the concept of organizational behaviour to understand the behaviour and culture of people in the organization.
	CO 2	Demonstrate the applicability of analysing the complexities associated with management of individual behaviour in the organization.
	CO 3	Analyse the complexities associated with Personality Development in the organization and role of leadership.
	CO 4	Demonstrate how the organizational behaviour can integrate in understanding the motivation between the formation of teams and stages of group development.
	CO 5	Demonstrate how the organizational behaviour can influence in understanding the development and culture of the individuals in the organization.

Contribution of Course Outcomes towards achievement of Program Outcomes		**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
	CO 1	-	-	-	-	-	-	-	3	3	-	2	-	-	-
	CO 2	-	-	-	-	-	-	-	3	3	-	2	-	-	-
	CO 3	-	-	-	-	-	-	-	3	3	-	2	-	-	-
	CO 4	-	-	-	-	-	-	-	3	3	-		-	-	-
	CO 5	-	-	-	-	-	-	-	3	3	-	2	-	-	-
	1- Low					**2-Medium**						**3-High**			

Course Content		
UNIT-1	**Introduction to Organizational Behaviour:** Definition of Organizational Behaviour-Nature and Scope of Organizational Behaviour-Opportunities of Organizational Behaviour-Linkage of Organizational Behaviour with other disciplines-Organizational Behaviour Models	**CO 1**
UNIT-2	**Foundations of Individual Behaviour: Perception:** Definition of Perception-Factors of Perception- The Perception Process-**Motivation:** Definition of Motivation-Theories of Motivation: Maslow's Hierarchy Theory of Needs-Herzberg's Two-Factor Theory-Mc Gregor's Theory of Motivation-**Learning:** Definition Learning- Objectives of Learning- Process of Learning- Theories of Learning-Classical conditioning theory- Operant conditioning theory.	**CO 2**

UNIT-3	**Personality Development and Leadership: Personality Development-** Definition of Personality-Objectives of Personality-Dimensions of Personality-Stages of Personality Development-**Leadership-** Definition of Leadership – Objectives of Leadership –Styles of Leadership in Organization	**CO 3**
UNIT-4	**Formation of Teams and Group Dynamics: Formation of Teams-** Definition of Team- Objectives of Teams -Types of Teams- Team Building-Creating Effective teams-**Group Dynamics:** Definition of Group- Formal Vs Informal Groups- Stages of Group Development-Johari Window-Transactional Analysis- Conflict -Definition, Conflict Resolution Mechanisms in Groups	**CO 4**
UNIT-5	**Organizational Change and Culture: Organizational Change-**Definition-Change Models- Organizational resistance to change Management of Change Process- Organizational Culture- Definition- Objectives-Distinction between Organizational Culture and Organisational Climate	**CO 5**

Learning Resources	
Text Books	1. Fred Luthans, Organizational Behaviour, McGraw Hill, 11th Edition, 2001. 2. Stephen P. Robins, Organisational Behaviour, PHI Learning / Pearson Education, 11th edition, 2008.
Reference Books	1. Hellrigal, Slocum and Woodman, Organizational Behaviour, Cengage Learning, 11th Edition 2007. 2. Aswathappa K., “Organizational Behaviour-Text, Cases and Games”, Himalaya Publishing House, New Delhi, 2008. 3. Schermerhorn, Hunt and Osborn, Organizational Behaviour, John Wiley, 9th Edition, 2008. 4. Udai Pareek, Understanding Organizational Behaviour, 2nd Edition, Oxford Higher Education, 2004. 5. Ivancevich, Konopaske &Maheson, Organizational Behaviour & Management, 7th edition, Tata McGraw Hill, 2008. 6. Hitt, Michael .A., Organizational Behaviour- A Strategic Approach, Wiley, India,2008.

INDUSTRIAL ENGINEERING MANAGEMENT

Course Code	20HS7701F	**Year**	IV	**Semester**	I
Course Category	**Humanities and Social Science Electives**	**Offering Branch**	ME	**Course Type**	Theory
Credits	3	**L-T-P**	3-0-0	**Prerequisites**	Nil
Continuous Internal Evaluation:	30	**Semester End Evaluation**	70	**Total Marks**	100

Course Outcomes: Upon successful completion of the course, the student will be able to				
	Statement	**Skill**	**BTL**	**Units**
CO1	Understand the basic concepts of management, organizational structures, leadership, operations management and project management.	Understand	L2	1,2,3,4,5
CO2	Explain the leadership qualities and concept of plant layout.	Understand	L2	2
CO3	Apply different quality control techniques.	Apply	L3	3
CO4	Illustrate various operations management Techniques	Apply	L3	4
CO5	Solve operations management and project management problems	Apply	L3	5

Contribution of Course outcomes towards achievement of Program outcomes &Strength of correlations (High:3, Medium: 2, Low:1)														
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	1					3		2			3			1
CO2	1					3		2			3			1
CO3	1					3		2			3			1
CO4	1					3		2			3			1
CO5	1					3		2			3			1

Syllabus		
UNIT	**Contents**	**Mapped CO**
I	**INTRODUCTION**: Definition of Industrial Engineering, Applications, Role of Industrial Engineer, Quantitative tools of IE, Functions of Management, Taylor's Scientific Management, Fayol's Principles of Management, Douglas Mc-Gregor's Theory X and Theory Y, Hertzberg's Two Factor Theory of Motivation, Maslow's Hierarchy of Human Needs. **ORGANISATIONAL STRUCTURES**: Basic concepts related to Organization – Depart mentation and Decentralization, Flat and Tall organizations, Organizational chart, Line organization, Line and staff organization, functional organization	**CO1**
II	**LEADERSHIP**: Introduction, Definition, Types of leadership based on authority- their area of applicability and suitability, advantages and limitations, Traits approach to leadership	**CO1, CO2**

	PLANT LOCATION: Definition, factors affecting the plant location, comparison of rural and urban sites. Plant Layout – definition, objectives, types of production, types of plant layout – various data analyzing forms-travel chart.	
III	**INSPECTION AND QUALITY CONTROL**: Types of inspections, Statistical Quality Control techniques, variables and attributes, assignable and non-assignable causes. **Control Charts:**variable control charts- X -bar and R charts, Attribute control charts- P-charts and C-charts. **Acceptance sampling-** Single Sampling, Double sampling, Multiple Sampling, OC curves.	**CO1, CO3**
IV	**WORK STUDY**: Definition, objectives, method study - definition, objectives, steps involved- various types of associated charts-out line process charts, flow process charts, two handed process charts and SIMO charts. **TIME STUDY**: definition, time study, steps involved-equipment, different methods of performance rating- allowances, standard time calculation.	**CO1, CO4**
V	**PROJECT MANAGEMENT**: Network modeling, Probabilistic model-various types of activity times estimation, programme evaluation review techniques (PERT), probability of completing the project, **Deterministic model-** critical path method (CPM), critical path calculation, crashing of simple of networks.	**CO1, CO5**

Learning Resources

Text Books:

1. S.Bhaskar, "Management Science", Anuradha Publications
2. O.P. Khanna, "Industrial Engineering and Management", DhanpatRai
3. T. R. Banga, S. C. Sharma, N. K. Agarwal, "Industrial Engineering and Management Science" Khanna Publishers.

Reference Books:

1. PannerSelvam, Production and Operations Management, PHI, 2004.
2. Ralph M Barnes, Motion and Time Studies, John Wiley and Sons, 2004.
3. Chase, Jacobs, Aquilano, Operations Management, TMH 10th Edition, 2003.
4. L.S.Srinath, PERT / CPM, affiliate East-West Press, New Delhi, 2000.
5. Phillip Kotler, Marketing Management, Pearson, 2004. 6. S. Bhaskar, "Management Science" Anuradha Publications.

PROJECT MANAGEMENT

Course Code	20HS7701G	Year	IV	Semester	I
Course Category	Humanities and Social Science Electives	Offering Branch	ME	Course Type	Theory
Credits	3	L-T-P	3-0-0	Prerequisites	Nil
Continuous Internal Evaluation	30	Semester End Evaluation	70	Total Marks	100

Course Outcomes: Upon successful completion of the course, the student will be able to				
	Statement	**Skill**	**BTL**	**Units**
CO1	Understand the concepts of project management.	Understand	**L2**	1,2,3,4,5
CO2	Explain procedure for analyzing the project risk, market risk and firm risk.	Understand	**L2**	2
CO3	Apply social-cost benefit analysis on a project.	Apply	**L3**	3
CO4	Analyze a project by applying various network techniques for planning, scheduling and controlling of different activities of a project.	Analyze	**L4**	4
CO5	Analyze various aspects to be considered for technical and financial analysis of the Project and the Environmental appraisal	Analyze	**L4**	5

Contribution of Course outcomes towards achievement of Program outcomes &Strength of correlations (High:3, Medium: 2, Low:1)														
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	2	1							2		3	2	2	1
CO2	2	1							2		3	2	2	1
CO3	2	1							2		3	2	2	1
CO4	2	1							2		3	2	2	1
CO5	2	1							2		3	2	2	1

Syllabus		
UNIT	**Contents**	**Mapped CO**
I	**Meaning, Nature and Importance of Project:** Introduction, Concept of project and project management, Characteristics of project, Project Family tree, Classification of Project, Project selection process, **Project life cycle**, Project report, Project appraisal, Tools and techniques for project management, Project manager's roles and responsibilities	**CO1**
II	**Analysis Of Project Risk, Market Risk And Firm Risk:** Introduction, Analysis of project risks- Projects with quantified benefits and not quantifiable benefits, **Market risk**- Security market risk, Interest rate risk, Purchasing Power Risk, Firm risk- Business risk, financial risk.	**CO1 CO2**
III	**Cost-Benefit Analysis:** Introduction, need for social cost benefit analysis, Procedure of social cost benefit analysis, Main feature of social cost benefit analysis,	**CO1 CO3**

	Cost-Benefit Analysis Approachs: Unido approach, Little-Mirrless approach, SCBA in India, Public investment decision making in India, Limitation of SCBA.	
IV	**NETWORK TECHNIQUES FOR PROJECTMANAGEMENT:** Introduction, Network modelling, Probabilistic model-various types of activity times estimation, Programme evaluation review techniques (PERT), probability of completing the project, **Deterministic model**- critical path method (CPM), critical path calculation, crashing of simple of networks	**CO1 CO4**
V	**TECHNICAL AND FINANCIAL ANALYSIS OF PROJECT:** Introduction, Technical Analysis-Materials and inputs, Production, Choice of technology, Product Mix, Plant capacity, Location and site, Structures and civil works, Project charts and layouts, financial analysis -Significance of financial analysis, Utility of financial and accounting statements, **ENVIRONMENTAL APPRAISAL OF PROJECTS:** Introduction, Types and Environmental Dimensions of a Project, Stresses on Environment, Environmental Impact Assessment Methodologies	**CO1 CO5**

Learning Resource
Text books:
1. Prasanna Chandra, Projects Planning, Implementation and Control, Tata McGraw Hill Publishing Company Limited, New Delhi, 1995.
Reference books
1. Project Management Institute (PMI), A Guide to the Project Management of Knowledge Newton Square, PA, 1996 2. J.R. Meredith and S.J. Mantel. Project Management: A Managerial Approach. John Wiley and Sons, New York, 1995. 3. L.S. Srinath, PERT & CPM Principles & Applications, 3rd edition, East west Press,2001.
e- Resources & other digital material
1. https://nptel.ac.in/courses/105/106/105106149/
2. https://nptel.ac.in/courses/110/104/110104073/

PVP SIDDHARTHA INSTITUTE OF TECHNOLOGY, KANURU, VIJAYAWADA

(AUTONOMOUS)
INFORMATION TECHNOLOGY

SALES FORCE TECHNOLOGIES

Course Code	20SA8756	**Year**	IV	**Semester**	I
Course Category	SC	**Branch**	IT	**Course Type**	Practical
Credits	2	**L-T-P**	1-0-2	**Prerequisites**	-
Continuous Internal Evaluation:	-	**Semester End Evaluation:**	50	**Total Marks:**	50

Course Outcomes		
Upon Successful completion of course, the student will be able to		
CO1	Understand the basics of CRM, multi-tenancy, Data modelling and management in Salesforce.	L2
CO2	Use basic programming constructs of Apex.	L3
CO3	Use advance programming constructs like class, interface triggers in Apex.	L3
CO4	Demonstrate the usage of Visual force and Lightening component framework	L3
CO5	Use various debugging and deployment tools of Salesforce	L3

Contribution of Course Outcomes towards the achievement of Program Outcomes & Strength of correlations (H: High, M: Medium, L: Low)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1				3									3	3
CO2				3									3	
CO3				3									3	
CO4													3	
CO5													3	

Syllabus		
Unit No	**Contents**	**Mapped CO**
I	**Salesforce Fundamentals:** What is a multi-tenancy, considerations, MVC paradigm, Core CRM objects. **Data Modeling and Management:** Data modeling, Relationship types, Visualizing and creating entity relationships, Importing and exporting data into development environments. **Practical Exercises:** 1. Create, setup Salesforce developer account and access developer console. 2. Exercise on Standard and custom objects, Relationship fields. 3. Exercise on how to import and export data.	**CO1**
II	**Apex:** Apex Basics, Class and instance, Features of Apex, Apex variables, constants and expressions, Access modifiers, Control flow statements, working with data in salesforce. **Practical Exercises:** 1. Exercise on install Force.com IDE and create projects. 2. Exercise on primitive data types, sObject, Enum and collections. 3. Exercise on control statements and looping statements.	**CO2**
III	**Apex Classes, Interfaces & Triggers:** Apex classes, interfaces, Apex triggers, sObject relationships, Implementing SOQL & SOSL queries, the order of execution, Exception handling, Security in Apex, Web service callouts **Practical Exercises:** 1. Exercise on creating Apex class. 2. Exercise on SOQL and SOSL Queries. 3. Exercise on working with Apex Triggers.	**CO3**
IV	**Salesforce user interface:** Introduction, Displaying Salesforce data using Visualforce, Lightning component framework, Benefits of Lightning component framework, Resources in Lightning component. **Practical Exercises:** 1. Exercise on displaying data using Visualforce and Visualforce pages. 2. Practice components in Lightning component framework.	**CO4**
V	**Debugging and Deployment tools:** Debugging and Deployment tools, Monitoring and accessing debug logs, deploying metadata to another org. **Practical Exercises:** 1. Exercise on creating sandbox and deployment strategies.	**CO5**

Learning Resources
Text Books
1. Salesforce Platform Developer I Certification Guide, John Vandevelde, Gunther Roskams, Packt Publishing.
References
1. Beginning Salesforce Developer, Michael Wicherski, Apress.
E-Recourses and other Digital Material
1. Salesforce Platform Developer I, Trail: https://trailhead.salesforce.com/content/learn/trails/platform-developer-i-certification

PVP SIDDHARTHA INSTITUTE OF TECHNOLOGY, KANURU, VIJAYAWADA

(AUTONOMOUS)

INFORMATION TECHNOLOGY

INDUSTRIAL/RESEARCH INTERNSHIP

Course Code	20IT3781B/C	**Year**	IV	**Semester**	I
Course Category	PC	**Branch**	IT	**Course Type**	Practical
Credits	3	**L-T-P**	0-0-0	**Prerequisites**	-
Continuous Internal Evaluation :	0	**Semester End Evaluation:**	50	**Total Marks:**	50

Course Outcomes		
Upon Successful completion of course, the student will be able to		
CO1	Formulate problem analysis by gaining domain knowledge elaborate through modeling and implementation through state of the art technology available	L3
CO2	Design solutions for engineering problems that meet specific needs for the societal and environmental consideration.	L4
CO3	Usage of modern tools to get appropriate solutions for the given requirements	L3
CO4	Prepare proper documentation consisting of Software Requirements Specification (SRS), Modeling techniques, Development Strategies, Implementation and testing strategies as a member of individual / Team work.	L3

Contribution of Course Outcomes towards achievement of Program Outcomes & Strength of correlations(3:Substantial,2: Moderate, 1:Slight)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1	2	2				1					3	2	2
CO2	1	2	2			2	1					3	2	2
CO3	1	2	2	1	3				2			2	2	2
CO4									3	2	2	3	2	2

PVP SIDDHARTHA INSTITUTE OF TECHNOLOGY, KANURU, VIJAYAWADA

(AUTONOMOUS)
INFORMATION TECHNOLOGY

CLOUD COMPUTING
(MINOR)

Course Code	20IT5701	**Year**	IV	**Semester**	I
Course Category	Minor	**Branch**	IT	**Course Type**	Theory
Credits	4	**L-T-P**	4-0-0	**Prerequisites**	DCCN
Continuous Internal Evaluation:	30	**Semester End Evaluation:**	70	**Total Marks:**	100

Course Outcomes		**Blooms Taxonomy Level**
Upon Successful completion of course, the student will be able to		
CO1	Understand Fundamental Concepts and Models of Cloud Computing and Cloud Enabling Technologies, Infrastructure Mechanisms	L2
CO2	Determine Cloud Infrastructure Mechanisms	L3
CO3	Determine different Cloud Maintenance strategies	L3
CO4	Analyze Cloud Architectures.	L3

Contribution of Course Outcomes towards achievement of Program Outcomes & Strength of correlations(3:Substantial,2:Moderate,1:Slight)

	PO1	PO2	PO3	PO4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO1	PSO2
CO1	3												2	
CO2	3			3									2	
CO3	3			3									2	
CO4	3	3											2	

Syllabus

Unit No	**Contents**	**Mapped CO**
I	**Understanding Cloud Computing**: Cloud origins and influences, basic concepts and terminology, goals and benefits, risks and challenges. **Fundamental Concepts and Models:** Roles and boundaries, cloud characteristics, cloud delivery models, cloud deployment models	**CO1**

II	**Cloud Enabling Technology:** Datacenter technology, virtualization technology, web technology, multitenant technology, service technology.	**CO1**
III	**Cloud Infrastructure Mechanisms:** Logical network perimeter, virtual server, cloud storage device, cloud usage monitor, resource replication	**CO1, CO2**
IV	**Specialized Cloud Mechanisms :**Automated Scaling Listener, Load Balancer, SLA Monitor, Pay-Per- Use Monitor, Audit Monitor, Fail over System, Hypervisor, Resource Cluster, Multi-Device Broker, State Management Database.	**CO3**
V	**Fundamental Cloud Architectures:** Workload distribution Architecture, resource pooling architecture, dynamic scalability architecture, elastic bresource capacity architecture, service load balancing architecture, cloud bursting architecture, elastic disk provisioning architecture, redundant storage architecture.	**CO1, CO4**

Learning Resources
Text Books
1.Thomas Erl, Ricardo Puttini, Zaigham Mahmood, Cloud Computing: Concepts ,Technology & Architecture, Prentice Hall,2013.
References
1. JohnW. Rittinghouse, JamesF. Ransome, Cloud Computing: Implementation, Management and Security, CRC Press,2012. 2. AnthonyT.Velte, TobyJVelte Robert Elsenpeter, Cloud Computing a practical approach, McGrawHill,2010. 3. MichaelMiller,CloudComputing:WebbasedApplicationsThatChangetheWay You Work and Collaborate Online, QuePublishing,2008.
e-Resources& other digital material
NPTELVIDEOLECTURES

PVP SIDDHARTHA INSTITUTE OF TECHNOLOGY, KANURU, VIJAYAWADA

(AUTONOMOUS)

INFORMATION TECHNOLOGY

APPLICATIONS OF DEEP LEARNING

(HONORS)

Course Code	20IT6701	**Year**	IV	**Semester**	I
Course Category	HONORS	**Branch**	IT	**Course Type**	Theory
Credits	4	**L-T-P**	4-0-0	**Prerequisites**	-
Continuous Internal Evaluation :	30	**Semester End Evaluation:**	70	**Total Marks:**	100

Course Outcomes		**Blooms Taxonomy Level**
Upon successful completion of the course, the student will be able to		
CO1	Understand the fundamental techniques and principles of deep learning.	**L2**
CO2	Apply concepts and major architectures of deep networks to build solutions for variety of problems.	**L3**
CO3	Apply Deep learning techniques to build applications in various domains.	**L3**
CO4	Analyze CNN techniques to classify images and detect objects and prepare an effective report.	**L4**

Contribution of Course Outcomes towards the achievement of Program Outcomes & Strength of correlations (H: High, M: Medium, L: Low)

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO 12**	**PSO1**	**PSO2**
CO1	3	3	3									3	3	3
CO2	3	3	3				2					3	3	3
CO3	3	3	2				3					3	3	3
CO4	3	3	3									2	3	3

Syllabus		
Unit No	**Contents**	**Mapped COs**
I	**A Review of Machine Learning**–The Learning Machines, How Can Machines Learn? Biological Inspiration, What Is Deep Learning? **Fundamentals of Deep Networks** – Defining Deep Learning, What Is Deep Learning? Common Architectural Principles of Deep Networks: Parameters, Layers, Activation Functions, Loss Functions, Hyper parameters.	**CO1,CO2**
II	**Building Blocks of Deep Networks–**RBMs, Auto encoders, Variation Auto encoders. **Major Architectures of Deep Networks:** Unsupervised pre trained networks, Deep Belief Networks , Generative Adversarial Networks.	**CO1,CO2**
III	**Convolution Neural Networks (CNNs) –** The Convolution Operation, Motivation, Pooling, Convolution and Pooling as an Infinitely Strong Prior, Variants of the Basic Convolution Function, Structured Outputs, Data Types, Efficient Convolution Algorithms, Random or Unsupervised Features	**CO1, CO4**
IV	**Sequence Modeling –** Recurrent and Recursive Nets – Unfolding Computational Graphs, Recurrent Neural Networks, Encoder-Decoder Sequence-to-Sequence Architectures, Deep Recurrent Networks, Recursive Neural Networks, The Long Short-Term Memory	**CO1, CO3**
V	**Deep Learning applications –** Computer Vision, Speech Recognition, Natural Language Processing, Other Applications**.**	**CO1, CO3**

Learning Resources
Text books
1. Deep learning: A practitioner's approach, JoshPattersonandAdamGibson,FirstEdition,2017,O'ReillyMedia. 2. Deep Learning, Iam Good fellow, Yoshua Bengio, AaronCourville, 2016,MITPress.
References
1. FundamentalsofDeepLearning,Designingnext-generationmachineintelligencealgorithms,NikhilBuduma, O‟Reilly, 2. Deep learning Cook Book, Practical recipes to ge tstarted Quickly, Douwe Osinga, O‟Reilly, 2019, Shroff Publishers.
e-Resources and other Digital Material
1. https://www.deeplearningbook.org/ 2. https://onlinecourses.nptel.ac.in/noc20_cs62/preview 3. https://www.udemy.com/share/101X6W/ (or) https://www.udemy.com/course/deep-learning-advanced-nlp/ 4. https://www.youtube.com/watch?v=5tvmMX8r_OM&list=PLtBw6njQRU-rwp57C0oIVt26ZgjG9NI

PVP SIDDHARTHA INSTITUTE OF TECHNOLOGY, KANURU, VIJAYAWADA

(AUTONOMOUS)
INFORMATION TECHNOLOGY

INFORMATION RETRIEVAL SYSTEMS
(Honors)

Course Code	20IT6701	**Year**	IV	**Semester**	I
Course Category	Honors	**Branch**	IT	**Course Type**	Theory
Credits	4	**L-T-P**	4-0-0	**Prerequisites**	-
Continuous Internal Evaluation :	30	**Semester End Evaluation:**	70	**Total Marks:**	100

Course Outcomes		**Blooms Taxonomy Level**
Upon successful completion of the course, the student will be able to		
CO1	Introduction to Information Retrieval Systems.	**L2**
CO2	Gain knowledge on capabilities of IRS.	**L2**
CO3	Applying various indexing techniques for information search.	**L3**
C04	Gain knowledge on applying various data structures.	**L3**

Contribution of Course Outcomes towards the achievement of Program Outcomes & Strength of correlations (H: High, M: Medium, L: Low)

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	3	3	3				3					3	3	3
CO2	3	3	3				3					3	3	3
CO3	3	3	3				2					3	3	3
CO4	3	3	3				2					3	3	3

Syllabus		
Unit No	**Contents**	**Mapped COs**
I	**Introduction**: Definition of Information Retrieval systems, Objectives of Information Retrieval systems, Functional Overview, Relationship to DBMS, Digital libraries and Data Warehouses.	**CO1**
II	**Information Retrieval System Capabilities:** Search Capabilities, Browse Capabilities, Miscellaneous Capabilities, Z39.50 and WAIS Standards	**CO1**
III	**Cataloging and Indexing**: History and Objectives of Indexing, Indexing Process, Automatic Indexing, Information Extraction.	**CO1** **CO2**
IV	**Data Structures**: Introduction to Data Structures, Stemming Algorithms, and Inverted file structures, N-gram data structure, PAT data structure, Signature file structure, Hyper text data structure, Hidden Markov Model.	**CO1** **CO4**
V	**Automatic Indexing**: Classes of Automatic Indexing, Statistical indexing: Probabilistic Weighting, Vector Weighting, Natural language, Concept indexing	**CO1** **CO3**

Learning Resources :

Textbooks:

1. M.T.M. Gerald J Kowalski, Information Storage and Retrieval Systems: Springer International Edition, 2018

Reference Books

[1]W.B. Frakes, Ricardo Baeza-Yates, Information Retrieval Data Structures and Algorithms: Prentice Hall PTR, 2015.

[2]R. Baeza-Yates, Modern Information Retrieval: Pearson Education, 2012.

e-Learning Resources

[1]https://nlp.stanford.edu/IR- book/pdf/01bool.pdf[2]

[2]http://shodhganga.inflibnet.ac.in/jspui/bitstream/10603/141878/10/10_chapter02.pdf

PVP SIDDHARTHA INSTITUTE OF TECHNOLOGY, KANURU, VIJAYAWADA

(AUTONOMOUS)

INFORMATION TECHNOLOGY

PERCEPTION AND COMPUTER VISION

(Honors)

Course Code	20IT6701	Year	IV	Semester	I
Course Category	Honors	Branch	IT	Course Type	Theory
Credits	4	L-T-P	4-0-0	Prerequisites	
Continuous Internal Evaluation :	30	Semester End Evaluation:	70	Total Marks:	100

Course Outcomes		Blooms Taxonomy Level
Upon successful completion of the course, the student will be able to		
CO1	Identify basic concepts, terminology, theories, models, and methods in the field of computer vision	L2
CO2	Understand known principles of the human visual system	L2
CO3	Apply basic methods of computer vision related to multi-scale representation, edge detection, and detection of other primitives, stereo, motion, and object recognition	L3
CO4	Analyze the design of a computer vision system for a specific problem	L4
C05	Evaluate the efficiency of computerVision	L5

Contribution of Course Outcomes towards the achievement of Program Outcomes & Strength of correlations (H: High, M: Medium, L: Low)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	3				3					3	3	3
CO2	3	3	3				3					3	3	3
CO3	3	3	3				3					3	3	3
CO4	3	3	3				3					3	3	3
CO5	3	3	2				2					2	2	2

Syllabus		
Unit No	**Contents**	**Mapped COs**
I	Introduction, the challenges, images and imaging operations in low-level vision, edge detection, corner, interest point, and invariant feature detection	**CO1**
II	Texture analysis, binary shape analysis, boundary pattern analysis, detection of linear, circular, and elliptic structures, the generalized Hough transform, pattern matching techniques	**CO2**
III	object segmentation and shape models, basic classification concepts, the three-dimensional world, invariants and perspective, image transformations and camera calibration, and motion	**CO3**
IV	Real-time vision systems, face detection, and recognition, surveillance in-vehicle vision systems	**CO4**
V	Machine learning and deep learning concepts in computer vision.	**CO5**

Learning Resources
Text Books
1. Computer vision by Dana H. Ballard, Christopher M. Brown, Prentice Hall 2. 3D computer vision: efficient methods and applications by Christian Wohler, Springer Berlin Heidelberg

PVP SIDDHARTHA INSTITUTE OF TECHNOLOGY, KANURU, VIJAYAWADA

(AUTONOMOUS)

INFORMATION TECHNOLOGY

MULTI AGENT SYSTEMS

(Honors)

Course Code	20IT6701	**Year**	IV	**Semester**	I
Course Category	Honors	**Branch**	IT	**Course Type**	Theory
Credits	4	**L-T-P**	4-0-0	**Prerequisites**	-
Continuous Internal Evaluation :	30	**Semester End Evaluation:**	70	**Total Marks:**	100

Course Outcomes		**Blooms Taxonomy Level**
Upon successful completion of the course, the student will be able to		
CO1	Gain Knowledge in Multi-agent and intelligent agents	**L1**
CO2	Understand the development of software agents	**L2**
CO3	Understand Agents and security	**L2**
CO4	Analyze the applications of agents	**L4**
CO5	Evaluate the Multi agent efficiency.	**L5**

Contribution of Course Outcomes towards the achievement of Program Outcomes & Strength of correlations (H: High, M: Medium, L: Low)

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	3	3	3				3					3	3	3
CO2	3	3	3				3					3	3	3
CO3	3	3	3									3	3	3
CO4	3	3	3				3					2	3	3
CO5	2	2										2	2	2

Syllabus		
Unit No	**Contents**	**Mapped COs**
I	**Agent Definition And Programming:**, Agent Programming Paradigms, Agent Vs. Object, Aglet, Mobile Agents, Agent Frameworks, Agent Reasoning **Interface Agents**: Metaphors with Character, Processes, threads, Components, Java Beans, ActiveX, Sockets, RPCs, Distributed Computing	**CO1**
II	**Agent-Oriented Programming**: Jini Architecture, Actors and Agents, Typed and proactive messages, Interaction between agents, Reactive Agents, Agent negotiation, Software Agent for Cooperative Learning, , Self - interested agents in electronic commerce applications, Agent Communication Languages	**CO2**
III	**Agent adaptability**: Agent-Based Framework for Interoperability, Agents for Information Gathering, Mobile Agent Applications, Towards an Industrial-Strength Open Agent Architecture, Agent Security Issues, Mobile Agents Security, Untrusted Agent, Authentication for agents, Security issues for aglets.	**CO3**
IV	**Multi-Agent System**: Theoretical approaches and NASA applications – Agent-based control for multi-UAV information collection- Agent-based decision support system for Glider pilots	**CO4**
V	**Multi-agent system in E-Health Territorial Emergencies** – Software Agents for computer network security- Multi-Agent Systems, Ontologies, and Negotiation for Dynamic Service Composition in Multi Organizational Environmental Management.	**CO5**

Learning Resources:
Textbooks:
1. Jeffrey M. Bradshaw, *Software Agents*, AAAI Press , 1997 **2.** Richard Murch, Tony Johnson, *Intelligent Software Agents*, Prentice Hall , 1999
References Text books:
1. Information Storage and Retrieval Systems: Theory and Implementation by Gerald J.Kowalski, Mark T.Maybury, Second Edition, Kluwer Academic Publishers

PVP SIDDHARTHA INSTITUTE OF TECHNOLOGY, KANURU, VIJAYAWADA
(AUTONOMOUS)
INFORMATION TECHNOLOGY

PROJECT WORK

Course Code	20IT3861	**Year**	IV	**Semester**	II
Course Category	PC	**Branch**	IT	**Course Type**	Practical
Credits	8	**L-T-P**	0-0-0	**Prerequisites**	-
Continuous Internal Evaluation :	60	**Semester End Evaluation:**	140	**Total Marks:**	200

Course Outcomes		**Blooms Taxonomy Level**
Upon successful completion of the course, the student will be able to		
CO1	Analyze a real world problem and identify its requirements.	**L4**
CO2	Design and document technical ideas, strategies and methodologies.	**L6**
CO3	Use tools, algorithms and/or techniques that contribute to the development of the project.	**L3**
CO4	Role-Play as a member and/or leader of a team to present the project.	**L6**

Contribution of Course Outcomes towards achievement of Program Outcomes & Strength of correlations (3:High, 2: Medium, 1:Low)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	3		3	3						3	3
CO2		3	3	3				3		3			3	3
CO3					3								3	3
CO4									3		3	3	3	3